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METHOD OF GENERATING MACHINING DATA CONFIGURED TO BE USED IN A SHEET PROCESSING SYSTEM

Abstract

A method used in a sheet process system, which executes a plurality of times of processes by using one or more sheet process apparatuses processing a sheet by performing one or more times of machining and obtains a product in a desired form from the sheet, and generates machining data for operating the sheet process apparatus, and the machining data generation apparatus **4** includes a machining condition input unit **51** that inputs a machining condition for obtaining the product in a desired form from the sheet; a data generation unit **8** that generates the machining data including each machining data piece for operating the sheet process apparatus in order to execute each process in the plurality of times of processes, on the basis of the input machining condition; and a data output unit **71** that outputs the generated machining data to the sheet process apparatus that executes each process.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] The present application is a continuation of U.S. patent application Ser. No. 17/480,351, which was filed on Sep. 21, 2021, which claims priority to Japanese Patent Application No. 2021-076168, which was filed on Apr. 28, 2021 and Japanese Patent Application No. 2020-158575, which was filed on Sep. 23, 2020. The contents of U.S. patent application Ser. No. 17/480,351, Japanese Patent Application No. 2021-076168 and Japanese Patent Application No. 2020-158575 are incorporated herein by reference.

BACKGROUND OF THE INVENTION
Technical Field
[0002] The present invention relates to a machining data generation apparatus that generates machining data for causing one or more sheet process apparatuses to execute a plurality of times of processes, and a sheet process system including the machining data generation apparatus.
Background Art
[0003] For example, in order to obtain a large number of products from one sheet, there is a case where machining is executed once on the sheet in a first sheet process apparatus and machining is executed many times in a second sheet process apparatus.
PRIOR ART REFERENCE
Patent Document
[0004] [Patent Document 1] JP2011-201646A.
SUMMARY OF THE INVENTION
Problem to be Solved by the Invention
[0005] In the above case, a user creates the machining data by setting a machining condition for the first sheet process apparatus, and creates the machining data by setting a machining condition for the second sheet process apparatus. Therefore, it is troublesome to create machining data for both apparatuses.
[0006] An object of the present invention is to provide a machining data generation apparatus that enables a user to easily create machining data even in the above-described case.
Means for Solving the Problem
[0007] A first aspect of the present invention is a machining data generation apparatus that is used in a sheet process system, which executes a plurality of times of processes by using one or more sheet process apparatuses processing a sheet by performing one or more times of machining and obtains a product in a desired form from the sheet, and generates machining data for operating the sheet process apparatus, and the machining data generation apparatus includes a machining condition input unit that inputs a machining condition for obtaining the product in a desired form from the sheet; a data generation unit that generates the machining data including each machining

data piece for operating the sheet process apparatus in order to execute each process in the plurality of times of processes, on the basis of the input machining condition; and a data output unit that outputs the generated machining data to the sheet process apparatus that executes each process.
[0008] A second aspect of the present invention is a sheet process system that executes a plurality of times of processes by using one or more sheet process apparatuses processing a sheet by performing machining one or more times, and obtains a product in a desired form from the sheet, and the sheet process system includes the machining data generation apparatus of the first aspect.
Effect of the Invention
[0009] With the machining data generation apparatus of the first aspect of the present invention, in a case where one or a large number of products are obtained from a sheet by using one or more sheet process apparatuses, a user can easily create the machining data.
[0010] With the sheet process system of the second aspect of the present invention, the user can easily obtain a product in the system that obtains one or a large number of products from a sheet by using one or more sheet process apparatuses.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0011] FIG. **1** is a diagram illustrating a sheet to be processed and a product to be obtained in a first embodiment;
[0012] FIG. **2** is a schematic plan view illustrating a sheet process system of the first embodiment;
[0013] FIG. **3** is a block diagram illustrating a configuration of a machining data generation apparatus;
[0014] FIG. **4** is a diagram illustrating six candidates of arrangement layouts;
[0015] FIG. **5** is a diagram illustrating products with different arrangement directions;
[0016] FIG. **6** is a diagram illustrating a process of candidate;
[0017] FIG. **7** is a diagram illustrating a process of candidate;
[0018] FIG. **8** is a diagram illustrating a process of candidate;
[0019] FIG. **9** is a block diagram illustrating a configuration of a machining data generation apparatus of a second embodiment;
[0020] FIG. **10** is a schematic plan view illustrating a sheet process system of a third embodiment;
[0021] FIG. **11** is a diagram illustrating a sheet to be processed and a product to be obtained in a fourth embodiment;
[0022] FIG. **12** is a schematic plan view illustrating a sheet process system of the fourth embodiment;
[0023] FIG. **13** is a diagram illustrating a selected arrangement layout;
[0024] FIG. **14** is a diagram illustrating a first-time process;
[0025] FIG. **15** is a diagram illustrating a second-time process;
[0026] FIG. **16** is a diagram illustrating a sheet to be processed and a product to be obtained in a fifth embodiment;
[0027] FIG. **17** is a diagram illustrating a selected arrangement layout;
[0028] FIG. **18** is a diagram illustrating a first-time process;
[0029] FIG. **19** is a diagram illustrating a second-time process;
[0030] FIG. **20** is a diagram illustrating a sheet to be processed and a product to be obtained in a sixth embodiment;
[0031] FIG. **21** is a schematic plan view illustrating a sheet process system of the sixth embodiment;
[0032] FIG. **22** is a diagram illustrating a selected arrangement layout;
[0033] FIG. **23** is a diagram illustrating a first-time process;

[0034] FIG. **24** is a diagram illustrating a second-time process;
[0035] FIG. **25** is a diagram illustrating a sheet to be processed and a machined product obtained by bending an obtained product in a seventh embodiment;
[0036] FIG. **26** is a diagram illustrating a product in the seventh embodiment;
[0037] FIG. **27** is a schematic plan view illustrating a sheet process system of the seventh embodiment;
[0038] FIG. **28** is a block diagram illustrating a configuration of a machining data generation apparatus of the seventh embodiment;
[0039] FIG. **29** is a diagram illustrating a first-time process;
[0040] FIG. **30** is a diagram illustrating a second-time process;
[0041] FIG. **31** is a block diagram illustrating a configuration of a sheet process apparatus of another embodiment;
[0042] FIG. **32** is a flowchart illustrating an example of an operation of the sheet process apparatus of FIG. **31**;
[0043] FIG. **33** is a flowchart illustrating another example of the operation of the sheet process apparatus of FIG. **31**;
[0044] FIG. **34** is a flowchart illustrating still another example of the operation of the sheet process apparatus of FIG. **31**;
[0045] FIG. **35** is a schematic sectional view illustrating a right angle transfer apparatus in another embodiment;
[0046] FIG. **36** is a partially enlarged view of FIG. **35**; and
[0047] FIG. **37** is a perspective view seen from arrow XXXVII of FIG. **36**.

DETAILED DESCRIPTION

[Basic Form]

[0048] A sheet process system of the present invention executes a plurality of times of processes by using one or more sheet process apparatuses each of which processes a sheet by performing machining one or more times, and obtains a product in a desired form from the sheet. A machining data generation apparatus of the present invention is used in such a sheet process system, and generates machining data for operating the sheet process apparatus.

[0049] A machining data generation apparatus includes a machining condition input unit that inputs a machining condition for obtaining a product in a desired form from a sheet, a data generation unit that generates machining data including machining data pieces for operating the sheet process apparatus to execute each process in a plurality of times of processes on the basis of the input machining condition, and a data output unit that outputs the generated machining data to the sheet process apparatus that executes each process.

[0050] In a case where the sheet process system uses two or more sheet process apparatuses, the data output unit outputs each machining data piece to each of the sheet process apparatuses. On the other hand, in a case where the sheet process system uses only one sheet process apparatus, the data output unit continuously outputs each machining data piece to the sheet process apparatus.

[0051] In a case where the sheet process system obtains a plurality of products from a sheet, the data generation unit includes a layout setting unit that sets an arrangement layout of products in the sheet, which is realizable by a plurality of times of processes, on the basis of the size of the sheet and the size of the product or on the basis of the size of the sheet, the size of the product, and the type of machining, which are included in the input machining condition, and generates machining data on the basis of the set arrangement layout.

[0052] In a case where the arrangement layout is automatically set, the layout setting unit includes a candidate creation unit that creates a plurality of candidates for the arrangement layout, and a candidate selection unit that selects a specific candidate from the plurality of created candidates on the basis of a predetermined criterion, and the machining data generation apparatus further includes a criterion input unit that inputs the predetermined criterion. On the other hand, in a case where the

user sets the arrangement layout, the layout setting unit includes a candidate creation unit that creates a plurality of candidates for the arrangement layout, and a candidate display unit that displays the plurality of created candidates, and the machining data generation apparatus further includes a candidate selection input unit by which a user selects a desired candidate from among the plurality of displayed candidates.

[0053] The candidate creation unit of the layout setting unit also creates a candidate in which at least a part of the products is rotated by 90 degrees such that the number of impositions per sheet is increased or such that the number of times of machining per sheet along a direction orthogonal to the transfer direction of the sheet is reduced.

[0054] The criterion input unit can input a predetermined criterion indicating that the number of impositions per sheet is maximum. Alternatively, the criterion input unit can input a predetermined criterion indicating that the process time per product is minimum.

[0055] The candidate creation unit creates the arrangement layout that is realizable by the final-time process in the plurality of times of processes and then creates the arrangement layout that is realizable by including the previous-time process, and the data generation unit generates the machining data indicating that the final-time process includes cutting machining of finish-cutting the sheet into the product.

[0056] It is preferable that in a case where at least any one of following (a) and (b) is satisfied,

[0057] (a) in a case where, in the sheet process apparatus that executes the N-th-time process, a size of the supplied sheet is larger than a size of the dischargeable sheet, [0058] (b) in a case where a size of the sheet supplied to the sheet process apparatus that executes the N-th-time process is larger than a size of the sheet suppliable to the sheet process apparatus that executes the N+1-th-time process, [0059] the N-th-time process (N is an integer of 1 or more) in the plurality of times of processes includes cutting machining of cutting the sheet.

[0060] The machining data generation apparatus described above may be used in a sheet process system that obtains one product from the sheet.

First Embodiment

[0061] In the present embodiment, a case will be described in which a sheet process system forms a large number of products **110** having a size of 140.0 mm×200.0 mm illustrated in (b) of FIG. **1**, from one sheet **100** having a B2 size illustrated in (a) of FIG. **1**. The product **110** has a perforation **1101** at the center in a longitudinal direction. Note that the sheet **100** and the product **110** are merely examples.

[0062] FIG. **2** is a schematic plan view illustrating the sheet process system of the present embodiment. A sheet process system **10** includes a first sheet process apparatus **1**, a right angle transfer apparatus **2**, a second sheet process apparatus **3**, and a machining data generation apparatus **4**. In the present embodiment, the size (B2 in this case) of the sheet supplied to the first sheet process apparatus **1** is larger than the size of the sheet suppliable to the second sheet process apparatus **3**.

[0063] The first sheet process apparatus **1** includes one machining device **11**, and machines the sheet **100** by the machining device **11** to feed the sheet in a transfer direction Y**1**. The machining device **11** moves a round blade **111** in a width direction X**1** orthogonal to the transfer direction Y**1** to cut the sheet **100** along the width direction X**1**. The sheet **100** is machined by the machining device **11** to be two sheet pieces.

[0064] The right angle transfer apparatus **2** transfers a sheet piece **101**, which has been fed in the transfer direction Y**1** from the first sheet process apparatus **1**, in a transfer direction Y**2** orthogonal to the transfer direction Y**1**.

[0065] The second sheet process apparatus **3** includes machining devices **31**, **32**, **33**, **34**, and **35**. The machining device **31** includes one perforation forming blade **311**, and forms a perforation along the transfer direction Y**2** at an arbitrary position in a width direction X**2** orthogonal to the transfer direction Y**2** of the sheet piece **101**. The machining device **32** includes one perforation

forming blade **321**, and forms a perforation along the width direction X**2** on the sheet piece **101**. The machining device **33** includes two slitters **331** and **332**, and cuts arbitrary two portions of the sheet piece **101** in the width direction X**2** along the transfer direction Y**2**. The machining device **34** includes two slitters **341** and **342**, and cuts arbitrary two portions of the sheet piece **101** in the width direction X**2** along the transfer direction Y**2**. The machining device **35** includes a guillotine blade **351** disposed along the width direction X**2**, and cuts the sheet piece **101** along the width direction X**2**.

(Machining Data Generation Apparatus)

[0066] As illustrated in FIG. **3**, the machining data generation apparatus **4** includes an input unit **5**, a control unit **6**, and an output unit **7**. As the machining data generation apparatus **4**, a notebook, desktop, or tablet computer, a smartphone, or another information terminal can be adopted. As the input unit **5**, a touch panel, a keyboard, a mouse, or another pointing device can be adopted. The control unit **6** is realized by a CPU, a ROM, a RAM, and the like. The output unit **7** has a wired or wireless transmission function. On the other hand, the first sheet process apparatus **1** and the second sheet process apparatus **3** include a reception unit (not illustrated) that receives an output from the output unit **7**.

[0067] The input unit **5** includes a machining condition input unit **51**. The machining condition input unit **51** can input machining conditions for obtaining a large number of products **110** from the sheet **100**. Specifically, the machining conditions include the size of the sheet **100**, the size of the product **110**, and the type of machining in the first sheet process apparatus **1** and the second sheet process apparatus **3**.

[0068] The control unit **6** controls the operation of the machining data generation apparatus **4**. The control unit **6** includes a data generation unit **8**, the data generation unit **8** includes a layout setting unit **81**, and the layout setting unit **81** includes a candidate creation unit **811** and a candidate selection unit **812**.

[0069] The input unit **5** also includes a criterion input unit **52** that inputs a predetermined criterion required by the candidate selection unit **812**. As the predetermined criterion, it is possible to adopt that the number of impositions per sheet is maximum or that the process time per product is minimum.

[0070] The output unit **7** includes a data output unit **71**. The data output unit **71** outputs the machining data generated by the data generation unit **8** to the first sheet process apparatus **1** and the second sheet process apparatus **3**. Since the machining data generated by the data generation unit **8** includes machining data piece for the first sheet process apparatus **1** and machining data piece for the second sheet process apparatus **3**, the data output unit **71** outputs the machining data piece for the first sheet process apparatus **1** to the first sheet process apparatus **1**, and outputs the machining data piece for the second sheet process apparatus **3** to the second sheet process apparatus **3**.

(Operation of Machining Data Generation Apparatus)

[0071] (1) First, a user inputs a machining condition through the machining condition input unit **51**. This machining conditions include that the sheet **100** has a B2 size, that the product **110** has a size of 140.0 mm×200.0 mm and has the perforation **1101** at the center in the longitudinal direction, and that the first sheet process apparatus **1** has the machining device **11** and the second sheet process apparatus **3** has the machining devices **31**, **32**, **33**, **34**, and **35**. Further, the user inputs the predetermined criterion through the criterion input unit **52**.

[0072] Note that the machining data generation apparatus **4** only needs to be able to recognize what kind of machining device the first sheet process apparatus **1** and the second sheet process apparatus **3** have, and the recognition method is not limited to the input from the machining condition input unit **51** by the user. For example, the following recognition method can be adopted. [0073] (i) Information on the machining device included in each sheet process apparatus is stored in advance in the control unit **6**, and the stored information on the machining device is read out. [0074] (ii) A reception unit (not illustrated) of the machining data generation apparatus **4** and a transmission unit

(not illustrated) of each sheet process apparatus are connected in a wired or wireless manner, and information on the machining device included in each sheet process apparatus is received from each sheet process apparatus. [0075] (iii) The input from the machining condition input unit **51** by the user and another recognition method are combined.

[0076] (2) When the machining conditions are input, the candidate creation unit **811** of the layout setting unit **81** creates six candidates A to F as illustrated in FIG. **4**.

[0077] Note that the candidate creation unit **811** creates candidates after extracting arrangeable orientations of the product **110** with respect to the sheet **100** as illustrated in FIG. **5**, on the basis of the input machining conditions. (a) of FIG. **5** illustrates a case where the product **110** is arranged at 0 degrees with respect to the sheet **100**, and (b) of FIG. **5** illustrates a case where the product **110** is arranged by being rotated by 90 degrees with respect to the sheet **100**. In the present embodiment, since the arrangement of (b) of FIG. **5** is also possible, the candidates B, C, D, and F also include the arrangement of (b) of FIG. **5**.

[0078] Further, after creating the arrangement layout that is realizable by the second sheet process apparatus **3**, the candidate creation unit **811** creates an arrangement layout that is realizable also by the first sheet process apparatus **1**. For example, as illustrated in FIG. **6**, in the candidate B, the sheet **100** is cut along a line **1** to form two sheet pieces **101**A and **101**B, but the sheet piece **101**A can be processed in the second sheet process apparatus **3** such that perforation machining is performed along lines **2**, **3**, and **4**, cutting machining is performed along lines **5** and **5**, and cutting machining is performed along lines **6**, **7**, **8**, **9**, **10**, and **11**, and the sheet piece **101**B can be processed such that perforation machining is performed along a line **2**, cutting machining is performed along lines **3** and **3**, and cutting machining is performed along lines **4**, **5**, **6**, **7**, **8**, **9**, **10**, and **11**. That is, the candidate B includes the arrangement layout that is realizable by the second sheet process apparatus **3**, and further includes the arrangement layout that is realizable by the first sheet process apparatus **1**. The same applies to the other candidates A, C to F.

[0079] (3) Next, the candidate selection unit **812** of the layout setting unit **81** selects a specific candidate from the six candidates A to F on the basis of the input predetermined criterion.

[0080] (3-1) In a case where the predetermined criterion is “the number of impositions per sheet is maximum”, the candidate selection unit **812** selects a candidate having the largest number of products **110** (that is, the number of impositions) arranged in one sheet **100**, that is, the candidate D.

[0081] (3-2) In a case where the predetermined criterion is “the process time per product is minimum”, the candidate selection unit **812** selects the candidate A by performing a comparison process as follows for each candidate. Here, the candidates A and D will be mainly described.

[0082] Comparison Process [0083] The sheet **100** of the candidate A is processed by the first sheet process apparatus **1** and the second sheet process apparatus **3** as illustrated in FIG. **7**. First, in the first sheet process apparatus **1**, the sheet **100** of the candidate A is cut along a line **1** by the machining device **11** to become two sheet pieces **101**. The two sheet pieces **101** are lined up in front and behind to be transferred to the second sheet process apparatus **3**. In the second sheet process apparatus **3**, each of the two sheet pieces **101** is formed with a perforation along a line **2** by the machining device **31**, is cut along lines **3** and **3** by the machining device **33** or the machining device **34**, and is cut along lines **4**, **5**, **6**, **7**, **8**, **9**, **10**, and **11** by the machining device **35**. In such machining, the machining that affects the process speed is machining in the width direction which needs to be performed by stopping the transfer of the sheet **100** and the sheet piece **101**, that is, machining along a line **1** with respect to the sheet **100** and along lines **4**, **5**, **6**, **7**, **8**, **9**, **10**, and **11** with respect to the sheet piece **101**. That is, the number of times of stop required in the process of the candidate A is **1** for the sheet **100**, and 8×2 for the two sheet pieces **101**.

[0084] Meanwhile, as the “process time”, at least a required time (machining time) in the machining device that performs machining affecting the process speed is used as an index. The required time is obtained by the product of the “number of times of stop” in the machining device

and the "machining coefficient" according to the type of the machining device. Note that the required time in the machining device that performs machining that does not affect the process speed can be ignored, and thus may be or may not be included in the process time. The machining coefficient is set to 3.0 for the machining device **11** (cutting along the width direction X**1**), 4.0 for the machining device **32** (perforation formation along the width direction X**2**), and 1.0 for the machining device **35** (cutting along the width direction X**2**), for example. For the machining coefficient in the machining device **32**, the machining coefficient may be changed according to the length of the perforation formed in the sheet piece in the width direction X**2** (however, set to a numerical value larger than 1.0).

[0085] For the candidate A, since the transfer is stopped once in the machining device **11** and the transfer is stopped **8**×**2**=**16** times in the machining device **35**, the process time is 1×3.0+16×1.0=19.0, and since the number of products is 8, the process time per product is 19.0/8=2.375. [0086] The sheet **100** of the candidate D is processed by the first sheet process apparatus **1** and the second sheet process apparatus **3** as illustrated in FIG. **8**. First, in the first sheet process apparatus **1**, the sheet **100** of the candidate D is cut along a line **1** by the machining device **11** to become two sheet pieces **101**C and **101**D. The two sheet pieces **101**C and **101**D are lined up in front and behind to be transferred to the second sheet process apparatus **3**. In the second sheet process apparatus **3**, the sheet piece **101**C is formed with perforations along lines **2**, **3**, and **4** by the machining device **32**, is cut along lines **5** and **5** by the machining device **33**, and is cut along lines **6**, **7**, **8**, **9**, **10**, and **11** by the machining device **35**. In the second sheet process apparatus **3**, the sheet piece **101**D is formed with perforations along lines **2**, **3**, and **4** by the machining device **32**, is cut along lines **5** and **5** by the machining device **33** or the machining device **34**, is cut along lines **6** and **6** by the machining device **34**, and is cut along lines **7**, **8**, **9**, **10**, **11**, and **12** by the machining device **35**. In such machining, the machining that affects the process speed is machining in the width direction which needs to be performed by stopping the transfer of the sheet **100** and the sheet pieces **101**C and **101**D, that is, machining along a line **1** with respect to the sheet **100**, along lines **2**, **3**, **4**, **6**, **7**, **8**, **9**, **10**, and **11** with respect to the sheet piece **101**C, and along lines **2**, **3**, **4**, **7**, **8**, **9**, **10**, **11**, and **12** with respect to the sheet piece **101**D. That is, the number of times of stop required in the process of the candidate D is 1 for the sheet **100**, 9 for the sheet piece **101**C, and 9 for the sheet piece **101**D.

[0087] For the candidate D, since the transfer is stopped once in the machining device **11**, the transfer is stopped 3×2=6 times in the machining device **32**, and the transfer is stopped 6×2=12 times in the machining device **35**, the process time is 1×3.0+6×4.0+12×1.0=39.0, and since the number of products is 9, the process time per product is 39.0/9=4.333. [0088] The process time per product for the other candidates is calculated as follows similarly to the candidates A and D. [0089] For the candidate B, since the process time is 1×3.0+3×4.0+14×1.0=29.0 and the number of products is 7, the process time per product is 29.0/7=4.143. [0090] For the candidate C, since the process time is 1×3.0+6×4.0+12×1.0=39.0 and the number of products is 6, the process time per product is 39.0/6=6.5. [0091] For the candidate E, since the process time is 1×3.0+12×1.0=15.0 and the number of products is 6, the process time per product is 15.0/6=2.5. [0092] For the candidate F, since the process time is 1×3.0+4×4.0+8×1.0=27.0 and the number of products is 6, the process time per product is 27.0/6=4.5.

[0093] Therefore, the candidate selection unit **812** selects the candidate A having the minimum process time per product.

[0094] (4) When the candidate A or the candidate D is selected as the specific candidate, the data generation unit **8** generates machining data for operating the first sheet process apparatus **1** and the second sheet process apparatus **3** to obtain the products **110** from the sheet **100** of the candidate A or the candidate D. Specifically, the data generation unit **8** generates machining data piece for operating the first sheet process apparatus **1** and machining data piece for operating the second sheet process apparatus **3** at a time. Note that the machining data piece for the second sheet process

apparatus **3** includes cutting machining for finish-cutting the sheet piece **101** into the products **110**.
[0095] (4-1) Machining Data in Case of Candidate A [0096] (i) Operating the machining device **11** once.fwdarw.(ii) operating the machining device **31** once.fwdarw.operating the machining device **33** or the machining device **34** once.fwdarw.operating the machining device **35** eight times.fwdarw.(iii) operating the machining device **31** once.fwdarw.operating the machining device **33** or the machining device **34** once.fwdarw.operating the machining device **35** eight times.
[0097] In the machining data, (i) is the machining data piece for the first sheet process apparatus **1**, and (ii) and (iii) are the machining data piece for the second sheet process apparatus **3**.
[0098] (4-2) Machining Data in Case of Candidate D [0099] (i) Operating the machining device **11** once.fwdarw.(ii) operating the machining device **32** three times.fwdarw.operating the machining device **33** or the machining device **34** once.fwdarw.operating the machining device **35** six times.fwdarw.(iii) operating the machining device **32** three times.fwdarw.operating the machining device **33** once.fwdarw.operating the machining device **34** once.fwdarw.operating the machining device **35** six times.
[0100] In the machining data, (i) is the machining data piece for the first sheet process apparatus **1**, and (ii) and (iii) are the machining data piece for the second sheet process apparatus **3**. Further, (ii) is machining data piece for the sheet piece **101**C, and (iii) is machining data piece for the sheet piece **101**D.
[0101] (5) Then, the data output unit **71** outputs the machining data piece (i) for the first sheet process apparatus **1** to the first sheet process apparatus **1**, and outputs the machining data pieces (ii) and (iii) for the second sheet process apparatus **3** to the second sheet process apparatus **3**.
(Effects of Machining Data Generation Apparatus)
[0102] According to the present embodiment, when the user inputs the machining condition from the machining condition input unit **51** and inputs the predetermined criterion from the criterion input unit **52**, the machining data piece (i) for the first sheet process apparatus **1** and the machining data pieces (ii) and (iii) for the second sheet process apparatus **3** are generated at a time as the machining data, and are sent to the first sheet process apparatus **1** and the second sheet process apparatus **3**. Therefore, the user is free from the trouble of creating the machining data by setting the machining condition for the first sheet process apparatus, and creating the machining data by setting the machining condition for the second sheet process apparatus. That is, in a case where a large number of products are obtained from a sheet by using two sheet process apparatuses, the user can easily create the machining data.
[0103] In the present embodiment, the size (B2 in this case) of the sheet supplied to the first sheet process apparatus **1** is larger than the size of the sheet suppliable to the second sheet process apparatus **3**, but, according to the present embodiment, the machining data indicating that the process of the first sheet process apparatus **1** includes the cutting machining of cutting the sheet **100** can be generated. As a result, the sheet pieces that have been cut to be smaller can be supplied to the second sheet process apparatus **3**, and thus the process in the second sheet process apparatus **3** can be executed.
[0104] That is, according to the present invention, in a case where the size of the sheet supplied to the sheet process apparatus that executes the N-th-time process is larger than the size of the sheet suppliable to the sheet process apparatus that executes the N+1-th-time process (N is an integer of 1 or more), the machining data indicating that the process of the sheet process apparatus that executes the N-th-time process includes the cutting machining of cutting the sheet can be generated. As a result, the sheet pieces that have been cut to be smaller can be supplied to the sheet process apparatus that executes the N+1-th-time process, and thus the process in the sheet process apparatus that executes the N+1-th-time process can be executed. More simply, even in a case where a large-sized sheet is used, it is possible to generate machining data that enables that a sheet is cut at an appropriate timing in a previous stage of the sheet process apparatus that can process only a small-sized sheet, to obtain small-sized sheet pieces, and as a result, it is possible to execute

the process in the sheet process apparatus that can process only a small-sized sheet.

(Operation of Sheet Process System)

[0105] When machining data is output from the machining data generation apparatus to the first sheet process apparatus **1** and the second sheet process apparatus **3**, the first sheet process apparatus **1** and the second sheet process apparatus **3** are operated on the basis of the machining data.

(Effects of Sheet Process System)

[0106] According to the present embodiment, the user can easily generate the machining data for operating the first sheet process apparatus **1** and the second sheet process apparatus **3** only by inputting the machining condition from the machining condition input unit **51** and inputting the predetermined criterion from the criterion input unit **52**, and can operate the first sheet process apparatus **1** and the second sheet process apparatus **3** on the basis of the machining data. Therefore, the user can easily obtain the product in the system that obtains a large number of products from the sheet by using the two sheet process apparatuses.

Second Embodiment

[0107] As illustrated in FIG. **9**, the present embodiment is different from the first embodiment in the layout setting unit **81** and the input unit **5**. Furthermore, the present embodiment includes a display unit **70** such as a display and a panel.

[0108] The layout setting unit **81** includes the candidate creation unit **811** and a candidate display unit **813**. The input unit **5** includes the machining condition input unit **51** and a candidate selection input unit **53**.

[0109] In the present embodiment, when the candidate creation unit **811** creates six candidates A to F as illustrated in FIG. **4**, the candidate display unit **813** displays the candidates A to F on the display unit **70**. The user can select a desired candidate among the displayed candidates A to F by the candidate selection input unit **53**.

[0110] When a desired candidate is selected, the machining data is generated and is sent to the first sheet process apparatus **1** and the second sheet process apparatus **3** as described in (4) and the following description for the operation of the first embodiment.

[0111] According to the present embodiment, since the user can select a candidate for the arrangement layout, it is easy to select the candidate, and it is possible to improve the work efficiency.

Third Embodiment

[0112] The sheet process system of the present invention also includes a case where three or more sheet process apparatuses are used. The sheet process system of the present embodiment uses three sheet process apparatuses.

[0113] FIG. **10** is a schematic plan view illustrating the sheet process system **10** of the present embodiment. The sheet process system **10** includes the first sheet process apparatus **1**, the right angle transfer apparatus **2**, two second sheet process apparatuses **3**, and the machining data generation apparatus **4**. The sheet process system **10** of the present embodiment is different from that of the first embodiment or the second embodiment only in that three sheet process apparatuses are provided.

[0114] The two second sheet process apparatuses **3** are provided on both sides of the right angle transfer apparatus **2**, and the right angle transfer apparatus **2** transfers one of two sheet pieces transferred from the first sheet process apparatus **1** to one second sheet process apparatus **3** and transfers the other sheet piece to the other second sheet process apparatus **3**.

[0115] Similarly to the first embodiment or the second embodiment, the machining data generation apparatus **4** generates the machining data including the machining data pieces (i) to (iii). Then, the machining data generation apparatus **4** outputs the machining data piece (i) to the first sheet process apparatus **1**, outputs the machining data piece (ii) to one second sheet process apparatus **3**, and outputs the machining data piece (iii) to the other second sheet process apparatus **3**.

[0116] According to the present embodiment, the same effects as those of the first embodiment can

be exhibited. Further, according to the present embodiment, since the two second sheet process apparatuses **3** are operated substantially at the same time, it is possible to improve the work efficiency.

Fourth Embodiment

[0117] The sheet process system of the present invention also includes a case where only one sheet process apparatus is used. In the present embodiment, a case will be described in which the sheet process system forms a large number of products **110**A having a business card size illustrated in (b) of FIG. **11**, from one sheet **100**A having an A4 size illustrated in (a) of FIG. **11**. The product **110**A has two concave creases **1102**. Note that the sheet **100**A and the product **110**A are merely examples.

[0118] FIG. **12** is a schematic plan view illustrating the sheet process system **10** of the present embodiment. The sheet process system **10** includes the machining data generation apparatus **4** and a sheet process apparatus **9**A. That is, the sheet process system **10** of the present embodiment is different from that of the first embodiment or the second embodiment only in that only one sheet process apparatus is used.

[0119] The sheet process apparatus **9**A includes machining devices **91**, **92**, **93**, and **94**. The machining device **91** includes two concave crease blades **911** and **912**, and forms concave creases along the transfer direction Y**2** at arbitrary two positions of the sheet **100**A in the width direction X**2**. The machining device **92** includes two slitters **921** and **922**, and cuts arbitrary two portions of the sheet **100**A in the width direction X**2** along the transfer direction Y**2**. The machining device **93** includes two slitters **931** and **932**, and cuts arbitrary two portions of the sheet **100**A in the width direction X**2** along the transfer direction Y**2**. The machining device **94** includes a guillotine blade **941** disposed along the width direction X**2**, and cuts the sheet **100**A along the width direction X**2**.

[0120] Also in the sheet process system **10** of the present embodiment, similarly to the first embodiment or the second embodiment, the machining data generation apparatus **4** is operated to select the candidate for the arrangement layout and generate the machining data. However, the machining data includes contents for causing the sheet process apparatus **9**A to continuously execute the process twice, and as the machining data, a machining data piece for causing the sheet process apparatus **9**A to execute the first-time process and a machining data piece for causing the sheet process apparatus **9**A to execute the second-time process are generated at a time. Then, the machining data pieces are continuously sent to the sheet process apparatus **9**A.

[0121] For example, in a case where an arrangement layout J illustrated in FIG. **13** is selected, the machining data is generated as follows.

(Machining Data Piece for Executing First-time Process)

[0122] As illustrated in FIG. **14**, the machining data piece is “operating the machining device **91** once” for forming creases along lines **1** and **1**.

(Machining Data Piece for Executing Second-time Process)

[0123] As illustrated in FIG. **15**, the machining data pieces are “operating the machining device **91** once” for forming creases along lines **2** and **2**, “operating the machining device **92** once” for cutting along lines **3** and **3**, “operating the machining device **93** once” for cutting along lines **4** and **4**, and “operating the machining device **94** eight times” for cutting along lines **5**, **6**, **7**, **8**, **9**, **10**, **11**, and **12**.

[0124] According to the present embodiment, the same effects as those of the first embodiment or the second embodiment can be exhibited.

Fifth Embodiment

[0125] The sheet process system of the present invention also includes a case where only one sheet process apparatus is used. In the present embodiment, a case will be described in which the sheet process system forms a large number of products **110**B having a business card size illustrated in (b) of FIG. **16**, from one sheet **100**A having an A4 size illustrated in (a) of FIG. **16**. The product **110**B has a concave crease **1103** and a convex crease **1104**. Note that the sheet **100**A and the product

110B are merely examples.
[0126] The sheet process system **10** of the present embodiment is the same as that of the fourth embodiment (FIG. **12**).
[0127] Also in the sheet process system **10** of the present embodiment, similarly to the first embodiment or the second embodiment, the machining data generation apparatus **4** is operated to select the candidate for the arrangement layout and generate the machining data. However, the machining data includes contents for causing the sheet process apparatus **9**A to continuously execute the process twice, and as the machining data, a machining data piece for causing the sheet process apparatus **9**A to execute the first-time process and a machining data piece for causing the sheet process apparatus **9**A to execute the second-time process are generated at a time. Then, the machining data pieces are continuously sent to the sheet process apparatus **9**A.
[0128] For example, in a case where an arrangement layout K illustrated in FIG. **17** is selected, the machining data is generated as follows.
(Machining Data Piece for Executing First-time Process)
[0129] As illustrated in FIG. **18**, the machining data piece is "operating the machining device **91** once" for forming creases along lines **1** and **1**. Thus, the concave creases **1103** are formed.
(Machining Data Piece for Executing Second-time Process)
[0130] For the sheet **100**A in a state in which the back side is upward, as illustrated in FIG. **19**, the machining data pieces are "operating the machining device **91** once" for forming creases along lines **2** and **2** (as a result, the convex creases **1104** in the sheet **100**A in a state in which the front side is upward are formed), "operating the machining device **92** once" for cutting along lines **3** and **3**, "operating the machining device **93** once" for cutting along lines **4** and **4**, and "operating the machining device **94** eight times" for cutting along lines **5**, **6**, **7**, **8**, **9**, **10**, **11**, and **12**.
[0131] According to the present embodiment, the same effects as those of the first embodiment or the second embodiment can be exhibited.
Sixth Embodiment
[0132] The sheet process system of the present invention also includes a case where only one sheet process apparatus is used. In the present embodiment, a case will be described in which the sheet process system forms a large number of products **110**C having a business card size illustrated in (b) of FIG. **20**, from one sheet **100**A having an A4 size illustrated in (a) of FIG. **20**. The product **110**C has two perforations **1105** and **1106** intersecting in a cross. Note that the sheet **100**A and the product **110**C are merely examples.
[0133] FIG. **21** is a schematic plan view illustrating the sheet process system **10** of the present embodiment. The sheet process system **10** includes the machining data generation apparatus **4** and a sheet process apparatus **9**B. That is, the sheet process system **10** of the present embodiment is different from that of the first embodiment or the second embodiment only in that only one sheet process apparatus is used.
[0134] The sheet process apparatus **9**B includes machining devices **95**, **96**, **97**, **98**, and **99**. The machining device **95** includes two perforation forming blades **951** and **952**, and forms perforations along the transfer direction Y**2** at arbitrary two positions of the sheet **100**A in the width direction X**2**. The machining device **96** includes two perforation forming blades **961** and **962**, and forms perforations along the transfer direction Y**2** at arbitrary two positions of the sheet **100**A in the width direction X**2**. The machining device **97** includes two slitters **971** and **972**, and cuts arbitrary two portions of the sheet **100**A in the width direction X**2** along the transfer direction Y**2**. The machining device **98** includes two slitters **981** and **982**, and cuts arbitrary two portions of the sheet **100**A in the width direction X**2** along the transfer direction Y**2**. The machining device **99** includes a guillotine blade **991** disposed along the width direction X**2**, and cuts the sheet **100**A along the width direction X**2**.
[0135] Also in the sheet process system **10** of the present embodiment, similarly to the first embodiment or the second embodiment, the machining data generation apparatus **4** is operated to

select the candidate for the arrangement layout and generate the machining data. However, the machining data includes contents for causing the sheet process apparatus **9**B to continuously execute the process twice, and as the machining data, a machining data piece for causing the sheet process apparatus **9**B to execute the first-time process and a machining data piece for causing the sheet process apparatus **9**B to execute the second-time process are generated at a time. Then, the machining data pieces are continuously sent to the sheet process apparatus **9**B.

[0136] For example, in a case where an arrangement layout L illustrated in FIG. **22** is selected, the machining data is generated as follows.

(Machining Data Piece for Executing First-time Process)

[0137] For the sheet **100**A in a state of being rotated by 90 degrees, as illustrated in FIG. **23**, the machining data pieces are "operating the machining device **95** once" for forming perforations along lines **1** and **1**, and "operating the machining device **96** once" for forming perforations along lines **2** and **2**. Accordingly, four perforations **1105** are formed.

(Machining Data Piece for Executing Second-time Process)

[0138] For the sheet **100**A in a state of being returned to 0 degrees, as illustrated in FIG. **24**, the machining data pieces are "operating the machining device **95** once" for forming perforations along lines **3** and **3** (as a result, two perforations **1106** are formed), "operating the machining device **97** once" for cutting along lines **4** and **4**, "operating the machining device **98** once" for cutting along lines **5** and **5**, and "operating the machining device **99** eight times" for cutting along lines **6**, **7**, **8**, **9**, **10**, **11**, **12**, and **13**.

[0139] According to the present embodiment, the same effects as those of the first embodiment or the second embodiment can be exhibited.

Seventh Embodiment

[0140] The sheet process system of the present invention also includes a case where one product is obtained from one sheet. As such a case, as illustrated in FIG. **25**, for example, there is a case where one sheet **100**A having an A4 size in (a) of FIG. **25** is machined into a Z-foldable state as in (b) of FIG. **25**. In this case, as illustrated in FIG. **26**, a product **110**D is the sheet **100**A having a concave crease **1108** and a convex crease **1109**. Note that the sheet **100**A and the product **110**D are merely examples.

[0141] FIG. **27** is a schematic plan view illustrating the sheet process system **10** of the present embodiment. The sheet process system **10** includes the machining data generation apparatus **4** and a sheet process apparatus **9**C. That is, the sheet process system **10** of the present embodiment uses only one sheet process apparatus.

[0142] The sheet process apparatus **9**C includes a machining device **90**. The machining device **90** includes one concave crease blade **901**, and forms a concave crease along the transfer direction Y**2** at an arbitrary position of the sheet **100**A in the width direction X**2**.

[0143] As illustrated in FIG. **28**, in the machining data generation apparatus **4**, the input unit **5** includes only the machining condition input unit **51**, and the data generation unit **8** does not include a layout setting unit. In the sheet process system **10** of the present embodiment, when the user inputs a machining condition from the machining condition input unit **51**, the data generation unit **8** generates machining data without creating an arrangement layout. However, the machining data includes contents for causing the sheet process apparatus **9**C to continuously execute the process twice, and as the machining data, a machining data piece for causing the sheet process apparatus **9**C to execute the first-time process and a machining data piece for causing the sheet process apparatus **9**C to execute the second-time process are generated at a time. Then, the machining data pieces are continuously sent to the sheet process apparatus **9**C.

[0144] The machining data is generated as follows.

(Machining Data Piece for Executing First-time Process)

[0145] For the sheet **100**A, as illustrated in FIG. **29**, the machining data piece is "operating the machining device **90** once" for forming a crease along a line **1**. Thus, a concave crease **1108** is

formed.
(Machining Data Piece for Executing Second-time Process)
[0146] For the sheet **100**A in a state in which the back side is upward, as illustrated in FIG. **30**, the machining data piece is "operating the machining device **90** once" for forming a crease along a line **2**. As a result, a convex crease **1109** in the sheet **100**A in a state in which the front side is upward is formed.
[0147] According to the present embodiment, the same effects as those of the first embodiment or the second embodiment can be exhibited.
[0148] In the present embodiment, two sheet process apparatuses may be used. In this case, one sheet process apparatus includes a machining device having one concave crease blade, and forms the concave crease **1108** on the sheet **100**A, and the other sheet process apparatus includes a machining device having one convex crease blade, and forms the convex crease **1109** on the sheet **100**A.
Other Embodiments
[0149] (1) The machining condition input from the machining condition input unit **51** may be only the size of the sheet and the size of the product.
[0150] (2) The machining condition input from the machining condition input unit **51** may include the dimension of the margin between the edge of the sheet and the product and/or the dimension of the margin between the product and the product. In this case, the layout setting unit can set an arrangement layout in consideration of the dimension of the margin input as the machining condition.
[0151] (3) The machining condition input from the machining condition input unit **51** may include the number of impositions. In this case, the layout setting unit can set an arrangement layout in consideration of the number of impositions input as the machining condition.
[0152] (4) The candidate creation unit **811** of the layout setting unit **81** may create candidates from the arrangement layout that is realizable by the previous process among a plurality of times of the processes.
[0153] (5) It is preferable that the machining data generation apparatus of the present invention generates the machining data indicating that, in a case where, in the sheet process apparatus that executes the N-th-time process, the size of the supplied sheet is larger than the size of the dischargeable sheet (N is an integer of 1 or more), the N-th-time process includes the cutting machining of cutting the sheet. For example, in the first embodiment, it is preferable that, in a case where, in the first sheet process apparatus **1**, the size of the supplied sheet is larger than the size of the dischargeable sheet, the machining data indicating that the process of the first sheet process apparatus **1** includes cutting machining of cutting the sheet is generated. According to this, it is possible to reliably discharge the sheet, which has been cut to be smaller, from the first sheet process apparatus **1**, and to execute the next stage process on the sheet.
[0154] (6) It is preferable that the sheet process system **10** of the present invention includes the following sheet process apparatus **300**. As illustrated in FIG. **31** which is a block diagram, the sheet process apparatus **300** includes a vertical machining device **301** that machines the sheet along the transfer direction, a movement mechanism **302** that moves a vertical machining blade **3011** of the vertical machining device **301** in the width direction orthogonal to the transfer direction, and a movement control unit **303** that controls the movement mechanism **302**.
[0155] The vertical machining blade **3011** of the vertical machining device **301** is, for example, the perforation forming blade **311** of the machining device **31**, the slitter **331** or **332** of the machining device **33**, or the slitter **341** or **342** of the machining device **34** of the second sheet process apparatus **3** illustrated in FIG. **2**; the concave crease blade **911** or **912** of the machining device **91**, the slitter **921** or **922** of the machining device **92**, or the slitter **931** or **932** of the machining device **93** of the sheet process apparatus **9**A illustrated in FIG. **12**; or the perforation forming blade **951** or **952** of the machining device **95**, the perforation forming blade **961** or **962** of the machining device

96, the slitter **971** or **972** of the machining device **97**, or the slitter **981** or **982** of the machining device **98** of the sheet process apparatus **9**B illustrated in FIG. **21**.

[0156] The movement mechanism **302** can adopt a known mechanism, for example, a mechanism using a slide rail and a rotating rod screw shaft. The movement control unit **303** is included in the control unit **60** that controls the operation of the sheet process apparatus **300**. The control unit **60** is realized by a CPU, a ROM, a RAM, and the like. Further, the sheet process apparatus **300** includes a reception unit **304** that receives an output from the output unit **7** of the machining data generation apparatus **4**. The control unit **60** controls the operation of the sheet process apparatus **300** on the basis of the output from the output unit **7** received by the reception unit **304**.

[0157] Then, in a case where it is necessary to move the vertical machining blade **3011** of the vertical machining device **301** in the width direction X**2** (refer to FIG. **2**) on the basis of the machining data piece of the machining data generated by the data generation unit **8** of the machining data generation apparatus **4**, the movement control unit **303** controls the movement mechanism **302** such that the movement mechanism **302** directly moves the vertical machining blade **3011** from the position of the vertical machining blade **3011** in the preceding vertical machining device **301** in the width direction X**2** to the position of the vertical machining blade **3011** in the following vertical machining device **301** in the width direction X**2**. This movement is referred to as “relative movement”.

[0158] Then, in a case where it is necessary to move the vertical machining blade **3011** of the vertical machining device **301** in the width direction X**2** on the basis of the machining data piece of the machining data generated by the data generation unit **8** of the machining data generation apparatus **4** and it is necessary to initialize the position of the vertical machining blade **3011** in the width direction X**2**, the movement control unit **303** controls the movement mechanism **302** such that the movement mechanism **302** directly moves the vertical machining blade **3011** from the position of the vertical machining blade **3011** in the preceding vertical machining device **301** in the width direction X**2** to a reference position set to a predetermined position in the width direction X**2**, and then moves the vertical machining blade **3011** to the position of the vertical machining blade **3011** in the following vertical machining device **301** in the width direction X**2**. This movement is referred to as “absolute movement”.

[0159] The sheet process apparatus **300** having the above configuration is operated as follows, for example.

First Example

[0160] The process illustrated in FIG. **7** will be described as an example. In the process of FIG. **7**, the first sheet process apparatus **1** processes the sheet **100**, and the second sheet process apparatus **3** processes the two sheet pieces **101**. However, in this example, the sheet process apparatus **300** processes the two sheet pieces **101**.

[0161] The two sheet pieces **101** are lined up in front and behind to be transferred to the sheet process apparatus **300**. In the sheet process apparatus **300**, each of the two sheet pieces **101** is formed with a perforation along a line **2** by the machining device **31**, is cut along lines **3** and **3** by the machining device **33** or the machining device **34**, and is cut along lines **4**, **5**, **6**, **7**, **8**, **9**, **10**, and **11** by the machining device **35**. Here, the machining devices **31**, **33**, and **34** correspond to the vertical machining device **301**.

[0162] In the above process on the two sheet pieces **101**, when the preceding (right side in the drawing) sheet piece **101** and the following (left side in the drawing) sheet piece **101** are viewed in the transfer direction (Y**2** direction), the positions of the perforation forming blade **311** of the machining device **31** and the slitters **331** and **332** of the machining device **33** (or the slitters **341** and **342** of the machining device **34**) in the width direction (X**2** direction), that is, the positions of a line **2** and lines **3** and **3** in the width direction are different from each other, and the positions are close to the left side in the preceding sheet piece **101** and are close to the right side in the following sheet piece **101**. Here, the perforation forming blade **311**, the slitters **331** and **332**, and the slitters

341 and **342** correspond to the vertical machining blade **3011**.

[0163] Thus, in the sheet process apparatus **300**, when the following sheet piece **101** is processed, for example, the perforation forming blade **311** of the machining device **31** is directly moved from the position of the perforation forming blade **311** in the width direction in a case of processing the preceding sheet piece **101** (the position corresponding to the line **2** close to the left side), to the position of the perforation forming blade **311** in the width direction in a case of processing the following sheet piece **101** (the position corresponding to the line **2** close to the right side). That is, the relative movement is performed. The same applies to the machining device **33** (or the machining device **34**), that is, when the following sheet piece **101** is processed, in the machining device **33** (or the machining device **34**), the slitters **331** and **332** (or the slitters **341** and **342**) are directly moved from the positions of the slitters **331** and **332** (or the slitters **341** and **342**) in the width direction in a case of processing the preceding sheet piece **101** (positions corresponding to the lines **3** and **3** close to the left side), to the positions of the slitters **331** and **332** (or the slitters **341** and **342**) in the width direction in a case of processing the following sheet piece **101** (positions corresponding to the lines **3** and **3** close to the right side). That is, the relative movement is performed.

[0164] According to this, for example, in a case where the position of the perforation forming blade **311** in the width direction for the preceding sheet piece **101** (the position of the line **2** close to the left side in the width direction) is 130 mm from the right end of the sheet piece **101**, and the position of the perforation forming blade **311** in the width direction for the following sheet piece **101** (the position of the line **2** close to the right side in the width direction) is 120 mm from the right end of the sheet piece **101**, it is only necessary to move the perforation forming blade **311** only 10 mm in the right direction when processing the following sheet piece **101**. The same applies to the machining device **33** (or the machining device **34**).

[0165] Note that a relative movement value, which is the distance of the relative movement, is obtained by subtracting “the position of the vertical machining blade **3011** of the following vertical machining device **301** in the width direction” from “the position of the vertical machining blade **3011** of the preceding vertical machining device **301** in the width direction”.

[0166] Therefore, with the sheet process apparatus **300**, since the movement distance of the vertical machining blade **3011** in the width direction can be shortened at the time of the process by the following vertical machining device **301**, it is possible to shorten the time required for the movement of the vertical machining blade **3011**, and it is possible to improve the productivity.

Second Example

[0167] For example, in a case where the process of FIG. **7** is continuously executed on a plurality of sheets **100**, the process in the sheet process apparatus **300** is such that “preceding sheet piece **101**.fwdarw.following sheet piece **101**” of the above-described first example is continuously executed. That is, the order is as follows: the preceding sheet piece **101**.fwdarw.the following sheet piece **101**.fwdarw.the preceding sheet piece **101**.fwdarw.the following sheet piece **101**.fwdarw.. In this case, the “relative movement” of the vertical machining blade **3011** of the vertical machining device **301** is performed not only in “the preceding sheet piece **101**.fwdarw.the following sheet piece **101**” but also in “the following sheet piece **101**.fwdarw.the preceding sheet piece **101**”.

[0168] Therefore, with the sheet process apparatus **300**, it is possible to shorten the movement distance of the vertical machining blade **3011** in the width direction not only at the time of the process by the following vertical machining device **301** but also at the time of the process by the preceding vertical machining device **301**, and thus it is possible to further improve the productivity.

Third Example

[0169] As illustrated in FIG. **32** which is a flowchart, the movement control unit **303** determines whether or not the received machining data has been changed to different machining data (S**701**), executes a relative movement in a case where it is determined that “the machining data has not been changed” (S**702**), and executes an absolute movement in a case where it is determined that

"the machining data has been changed" (S**703**). For example, in a case where the process illustrated in FIG. **7** is changed to the process illustrated in FIG. **8**, the machining data corresponding to the process illustrated in FIG. **7** is changed to the machining data corresponding to the process illustrated in FIG. **8**, and thus, it is determined that "the machining data has been changed" in S**701**.

[0170] According to the present example, since the absolute movement is performed at the beginning of the change of the process, subsequent machining in the changed process can be accurately executed.

Fourth Example

[0171] As illustrated in FIG. **33** which is a flowchart, the movement control unit **303** counts the number of processed sheets after the execution of the absolute movement, determines whether or not the counted number has reached a predetermined number (S**711**), executes the relative movement in a case where it is determined as "the counted number has not reached the predetermined number" (S**712**), and executes the absolute movement in a case where it is determined that "the counted number has reached the predetermined number" (S**713**).

[0172] According to the present example, the following operational effects can be exhibited.

[0173] (a) Since the "relative movement" is continuously executed until the predetermined number of sheets **100** are processed, it is possible to shorten the movement time of the vertical machining blade **3011** in the width direction, and thus it is possible to improve the productivity.

[0174] (b) When only the "relative movement" is continuously executed, for example, the position of the vertical machining blade **3011** in the width direction may deviate from an accurate position due to the occurrence of a defect such as step out of the vertical machining blade **3011** or the movement mechanism **302**, and the position of the vertical machining blade **3011** in the width direction may deviate even in all subsequent machining. However, in the present example, since the "absolute movement" is executed when the predetermined number (for example, **50**) of sheets **100** are processed, even when the position of the vertical machining blade **3011** in the width direction deviates in the previous continuous work of the "relative movement", the deviation can be corrected by the "absolute movement", and the subsequent machining can be accurately executed.

Fifth Example

[0175] As illustrated in FIG. **34** which is a flowchart, the movement control unit **303** determines whether or not the received machining data is changed to different machining data (S**721**). The movement control unit **303** executes the absolute movement in a case where it is determined that "the machining data is changed" (S**722**). In a case where it is determined that "the machining data is not changed", the movement control unit **303** counts the number of processed sheets after the execution of the absolute movement, determines whether or not the counted number has reached the predetermined number (S**723**), executes the relative movement in a case where it is determined that "the counted number has not reached the predetermined number" (S**724**), and executes the absolute movement in a case where it is determined that "the counted number has reached the predetermined number" (S**725**).

[0176] According to the present example, the same operational effects as those of the third example and the fourth example described above can be exhibited.

[0177] (7) It is preferable that the right angle transfer apparatus **2** used in the sheet process system **10** of the present invention includes a blower mechanism **210** for assisting the transfer. As illustrated in FIG. **35**, the right angle transfer apparatus **2** places the sheet piece **101** fed from the first sheet process apparatus **1** in the transfer direction Y**1** on a transfer belt **203** on a transfer roller **202**, and transfers the sheet piece in the transfer direction Y**2** orthogonal to the transfer direction Y**1**, and at that time, the leading end of the sheet piece **101** is brought into sliding contact with a transfer direction guide **201** extending along the transfer direction Y**2**.

[0178] As illustrated in FIG. **35**, the blower mechanism **210** blows air between the back surface of the sheet piece **101** fed from a transfer roller pair **120** of the first sheet process apparatus **1** and the upper surface of the transfer belt **203**. FIG. **36** is an enlarged partial view of the blower mechanism

210 of FIG. **35**. The blower mechanism **210** includes a blower fan **211**, a blower upper guide plate **212**, a straightening plate **213**, and a blower lower guide plate **214**. A gap **221** between the blower upper guide plate **212** and the blower lower guide plate **214** is open in a lateral direction, and the opening is an air blowing port **222**. The straightening plate **213** is sandwiched between the blower upper guide plate **212** and the blower lower guide plate **214**, and has a comb-like form in which a large number of notches **2131** are formed side by side as illustrated in FIG. **37** which is a perspective view seen from arrow XXXVII of FIG. **36**. The notch **2131** is open in the lateral direction similarly to the gap **221**. The opening position of the notch **2131** and the position of the air blowing port **222** are set at the same position in plan view. The entire length of the notch **2131** is set to be longer than a distance L**1** from an opening position P**1** to a position P**2** of the proximal end edge of the blower lower guide plate **214**. Therefore, the back portion of the notch **2131** is open downward.

[0179] In a case where the right angle transfer apparatus **2** does not include the blower mechanism **210**, the following problems may occur. That is, in a case where the dimension of the sheet piece **101** fed from the first sheet process apparatus **1** in the transfer direction Y**1** is small, the sheet piece **101** is transferred in the transfer direction Y**2** by the transfer belt **203** before the leading end of the sheet piece **101** comes into contact with the transfer direction guide **201** or before the leading end of the sheet piece **101** sufficiently comes into contact with the transfer direction guide **201**, and the position in the width direction of the sheet piece **101** transferred to the second sheet process apparatus **3** deviates, so that the machining in the second sheet process apparatus **3** becomes inaccurate. This is because the sheet piece **101** fed from the first sheet process apparatus **1** in the transfer direction Y**1** comes out of the transfer roller pair **120** of the first sheet process apparatus **1** before reaching the transfer direction guide **201**, loses the transfer force for reaching the transfer direction guide **201**, and falls on the transfer belt **203**. Such a sheet piece **101** is indicated by a two-dot chain line in FIG. **35**.

[0180] However, in a case where the right angle transfer apparatus **2** includes the blower mechanism **210**, the blower mechanism **210** is operated as follows, so that it is possible to prevent the occurrence of the above-described trouble. That is, when the first sheet process apparatus **1** is operated, the blower mechanism **210** of the right angle transfer apparatus **2** is also operated. In the blower mechanism **210**, when the blower fan **211** is operated, the air is blown upward to rise as indicated by an arrow A, abuts against the blower upper guide plate **212** and the straightening plate **213** to deflect in the horizontal direction, passes through the notches **2131** of the straightening plate **213**, and is blown out from the air blowing port **222** in the transfer direction Y**1**. Then, the blown air flows in the transfer direction Y**1** between the back surface of the sheet piece **101** fed from the transfer roller pair **120** and the upper surface of the transfer belt **203**. Therefore, the sheet piece **101** fed from the transfer roller pair **120** is floated and pushed out in the transfer direction Y**1** by the air blowing. That is, the air blowing by the blower fan **211** can apply the transfer force in the transfer direction Y**1**, to the sheet piece **101** fed from the transfer roller pair **120**, and thus can assist the transfer of the sheet piece **101**.

[0181] Therefore, in a case where the right angle transfer apparatus **2** includes the blower mechanism **210**, even in a case where the dimension of the sheet piece **101** fed from the first sheet process apparatus **1** in the transfer direction Y**1** is small, the leading end of the sheet piece **101** can come into contact with the transfer direction guide **201**, and as a result, it is possible to prevent the deviation of the position in the width direction of the sheet piece **101** transferred to the second sheet process apparatus **3**.

[0182] It is preferable that the distance L**1** of the notch **2131** is set to be long. In this case, the straightness of the air blown out from the air blowing port **222** along the transfer direction Y**1** is enhanced, so that the air blown out from the air blowing port **222** can assist the transfer of the sheet piece **101** to a far place in the transfer direction Y**1** without diffusing on the transfer belt **203**. Incidentally, it has been confirmed that when the distance L**1** is actually set to 20 mm, the air is

sent to the transfer direction guide **201** at a distance of about 440 mm from the air blowing port **222**.

INDUSTRIAL APPLICABILITY

[0183] With the machining data generation apparatus of the present invention, since the user can easily create the machining data, it is possible to exhibit great industrial applicability.

DESCRIPTION OF REFERENCE NUMERALS

[0184] **1**, **3**, **9**A-C Sheet process apparatus
[0185] **10** Sheet process system
[0186] **100**, **100**A Sheet
[0187] **110**, **110**A-C Product
[0188] **4** Machining data generation apparatus
[0189] **51** Machining condition input unit
[0190] **52** Criterion input unit
[0191] **53** Candidate selection unit
[0192] **71** Data output unit
[0193] **8** Data generation unit
[0194] **81** Layout setting unit
[0195] **811** Candidate creation unit
[0196] **812** Candidate selection unit
[0197] **813** Candidate display unit

Claims

1. A method of generating machining data to be used in a sheet process system, the sheet processing system comprising: a first sheet processing apparatus including at least a first machining device for executing a first processing that includes supplying a sheet, machine processing the sheet by the first machining device, and discharging a first product obtained from the machine processing by the first machining device, and a second sheet processing apparatus including at least a second machining device for executing a second processing that includes supplying the first product, machine processing the first product by the second machining device, and discharging a second product obtained from the machine processing by the second machining device, the method of generating machining data comprising: inputting machining conditions for obtaining the second product from the sheet, the input machining conditions include information about a size of the sheet and sizes of the first and second products; storing the machining conditions; generating, based on the stored machining conditions: first machining data that causes the first sheet process apparatus to execute the first processing to obtain the first product from the sheet based on the input machining conditions, and second machining data that is different from the first machining data and that causes the second sheet process apparatus to execute the second processing to obtain the second product from the first product based on the input machining conditions, and transmitting the generated first machining data to the first sheet process apparatus, and transmitting the generated second machining data to the second sheet process apparatus.

2. The method of generating machining data according to claim 1, wherein in the sheet processing system in which two or more of the sheet processing apparatuses are used, and each machining data is input to each of the sheet processing apparatuses, respectively.

3. The method of generating machining data apparatus according to claim 1, wherein, the first sheet processing apparatus and the second sheet processing apparatus is one processing apparatus, and the first machining data is machining data that causes the sheet processing system to execute the first processing, and the second machining data is machining data that causes the sheet processing apparatus to execute the second processing.

4. The method of generating machining data apparatus according to claim 1, wherein in the sheet

processing system that obtains a plurality of the products from the sheet, setting an arrangement layout of the products in the sheet which is realizable by the processes, on the basis of a size of the sheet and a size of the product or on the basis of a size of the sheet, a size of the product, and a type of the machining, which are included in the input machining condition, and generating the machining data on the basis of the set arrangement layout.

5. The method of generating machining data according to claim 2, wherein in the sheet processing system that obtains a plurality of the products from the sheet, setting an arrangement layout of the products in the sheet which is realizable by the processes, on the basis of a size of the sheet and a size of the product or on the basis of a size of the sheet, a size of the product, and a type of the machining, which are included in the input machining condition, and generating the machining data on the basis of the set arrangement layout.

6. The method of generating machining data according to claim 3, wherein in sheet processing system that obtains a plurality of the products from the sheet, setting an arrangement layout of the products in the sheet which is realizable by the processes, on the basis of a size of the sheet and a size of the product or on the basis of a size of the sheet, a size of the product, and a type of the machining, which are included in the input machining condition, and generating the machining data on the basis of the set arrangement layout.

7. The method of generating machining data according to claim 4, wherein the method further includes creating a plurality of candidates for the arrangement layout, and selecting a specific candidate from the plurality of created candidates on the basis of a predetermined criterion, and inputting the predetermined criterion.

8. The method of generating machining data according to claim 4, wherein the method further includes creating a plurality of candidates for the arrangement layout, and displaying the plurality of created candidates, and selecting a desired candidate from among the plurality of displayed candidates.

9. The method of generating machining data according to claim 7, creating a candidate in which at least a part of the products is rotated by 90 degrees such that the number of impositions per sheet is increased or such that the number of times of machining per sheet along a direction orthogonal to the transfer direction of the sheet is reduced.

10. The method of generating machining data according to claim 7, wherein the predetermined criterion is that the number of impositions per sheet is maximum.

11. The method of generating machining data according to claim 7, wherein the predetermined criterion is that a process time per product is minimum.

12. The method of generating machining data according to claim 7, wherein the method further comprises: creating the arrangement layout that is realizable by the final-time process in the processes and then creating the arrangement layout that is realizable by including the previous-time process, and generating the machining data indicating that the final process includes cutting machining of finish-cutting the sheet into the product.

13. The method of generating machining data according to claim 8, creating the arrangement layout that is realizable by the final-time process in the processes and then creating the arrangement layout that is realizable by including the previous-time process, and generating the machining data indicating that the final process includes cutting machining of finish-cutting the sheet into the product.

14. The method of generating machining data according to claim 1, wherein in a case where at least any one of following (a) and (b) is satisfied, (a) in a case where, in the sheet processing apparatus that executes the N-th-time process, a size of the supplied sheet is larger than a size of the dischargeable sheet, (b) in a case where a size of the sheet supplied to the sheet processing apparatus that executes the N-th-time process is larger than a size of the sheet suppliable to the sheet processing apparatus that executes the N+1-th-time process, the N-th-time process (N is an integer of 1 or more) in the plurality of times of processes includes cutting machining of cutting the

sheet.

15. The method of generating machining data according to claim 1, wherein the sheet processing system obtains one product from the sheet.

16. The method according to claim 1, wherein the sheet processing system that executes a plurality processes by using one or more sheet processing apparatuses processing a sheet by performing machining one or more times, and obtains a product in a desired form from the sheet.

17. The method according to claim 16, wherein at least one of the sheet processing apparatuses includes a vertical machining device that machines the sheet along a transfer direction, a movement mechanism that moves a vertical machining blade of the vertical machining device in a width direction orthogonal to the transfer direction, and a movement control unit that controls the movement mechanism, the movement control unit controls the movement mechanism such that in a case where the vertical machining blade of the vertical machining device is required to be moved in the width direction on the basis of the machining data piece of the machining data generated by the data generation unit of the machining data generation apparatus, the vertical machining blade is directly moved from a position of the vertical machining blade in the width direction in the preceding vertical machining device to a position of the vertical machining blade in the width direction in the following vertical machining device.

18. The method according to claim 1, wherein in the first processing, the machine processing of the sheet by the first machining device is a cutting processing to cut the sheet into at least two pieces, and the first product is the at least two pieces of the cut sheet, and in the second processing, the machine processing of the first product by the second machining device is a machine processing of the two pieces of the cut sheet by the second machining device, and generating the first machining data that causes the first sheet processing apparatus to execute the first processing to obtain the two pieces of the cut sheet from the sheet, and generating the second machining data that causes the second sheet processing apparatus to execute the second processing to obtain the second product from the two pieces of the cut sheet.

19. The method according to claim 1, wherein generating the first and second machining data based also on what kind of machining device the first sheet processing apparatus and the second sheet processing apparatus have.

20. The method according to claim 19, wherein information concerning what kind of machining device the first sheet processing apparatus and the second sheet processing apparatus have is stored in the storage.