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Printing apparatus and method for controlling printing apparatus

Abstract

Provided is a printing apparatus including a communication section configured to communicate with an external apparatus and receive print data and a cut command, a connector configured to be coupled to any one of a first peripheral apparatus and a second peripheral apparatus, a head, a cutter, and a control section configured to control the head and the cutter, in which the control section is configured to, when receiving, by the communication section, reception information including a plurality of pieces of the print data and a plurality of the cut commands after no reception for a predetermined period of time, transmit a drive command to the first peripheral apparatus via the connector based on at least one cut command among the cut commands included in the reception information to drive the first peripheral apparatus, and not transmit the drive command to the first peripheral apparatus based on another cut command.

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Background/Summary

(1) The present application is based on, and claims priority from JP Application Serial Number 2023-001528, filed Jan. 10, 2023, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

(2) The present disclosure relates to a printing apparatus and a method for controlling a printing apparatus.

2. Related Art

(3) Printers that output a signal from an interface for a cash drawer to a notification apparatus to cause a buzzer to ring when issuing a slip are known.

(4) However, since a printer described in JP-A-2017-138811 causes a buzzer to ring every time a slip is issued, some staff members may feel annoyed.

SUMMARY

(5) According to an aspect of the present disclosure, there is provided a printing apparatus including a communication section configured to communicate with an external apparatus and receive print data and a cut command, a connector configured to be coupled to any one of a first

peripheral apparatus and a second peripheral apparatus, a head configured to print the print data on recording paper, a cutter configured to cut the recording paper based on the cut command, and a control section configured to control the head and the cutter, in which the control section is configured to, when receiving, by the communication section, reception information including a plurality of pieces of the print data and a plurality of the cut commands after no reception for a predetermined period of time, transmit a drive command to the first peripheral apparatus via the connector based on at least one cut command among the cut commands included in the reception information to drive the first peripheral apparatus, and not transmit the drive command to the first peripheral apparatus based on another cut command.

(6) According to another aspect of the present disclosure, there is provided a method for controlling a printing apparatus, the apparatus including: a communication section configured to communicate with an external apparatus and receive print data and a cut command, a connector configured to be coupled to a first peripheral apparatus, a head configured to print the print data on recording paper, and a cutter configured to cut the recording paper based on the cut command, the method including: when receiving, by the communication section, reception information including a plurality of pieces of the print data and a plurality of the cut commands after no reception for a predetermined period of time, transmitting a drive command to the first peripheral apparatus via the connector based on one cut command among the cut commands included in the reception information to drive the first peripheral apparatus, and not transmitting the drive command to the first peripheral apparatus based on another cut command.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a block diagram illustrating a configuration of a printing apparatus to which a first peripheral apparatus is coupled.

(2) FIG. **2** is a schematic diagram illustrating a configuration of a main portion of the printing apparatus.

(3) FIG. **3** is a circuit diagram illustrating the first peripheral apparatus and the main portion of the printing apparatus when the first peripheral apparatus is coupled.

(4) FIG. **4** is a state transition diagram illustrating a method for controlling the printing apparatus when reception information including a plurality of pieces of print data and a plurality of cut commands is received.

(5) FIG. **5** is a schematic diagram illustrating a print result when the method for controlling the printing apparatus according to FIG. **4** is executed.

(6) FIG. **6** is a state transition diagram illustrating the method for controlling the printing apparatus when there is no reception.

(7) FIG. **7** is a schematic diagram illustrating a print result when the method for controlling the printing apparatus according to FIG. **6** is executed.

(8) FIG. **8** is a state transition diagram illustrating a method for controlling the printing apparatus when next reception information is received after there is no reception.

(9) FIG. **9** is a schematic diagram illustrating a print result when the method for controlling the printing apparatus according to FIG. **8** is executed.

(10) FIG. **10** is a circuit diagram illustrating a second peripheral apparatus and the main portion of the printing apparatus when the second peripheral apparatus is coupled.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

1. Embodiment

(11) 1-1. Printing Apparatus to which First Peripheral Apparatus is Coupled

(12) As illustrated in FIG. **1**, a printing apparatus **1** includes a first control section **11**, a first storage

section **12**, a communication section **13**, a printing section **14** including a head **15***a* and a roller **15***b*, a cutter **16**, a driving circuit **17**, a connector CN **18**, and a power supply **19**. In the following description, the connector CN **18** is simply referred to as a CN **18**.

(13) The printing apparatus **1** can be coupled to a first peripheral apparatus **2** via the CN **18**, and can communicate with an external apparatus **4** via the communication section **13**. The printing apparatus **1** according to the embodiment is used in, for example, a point of sale (POS) system.

(14) The first control section **11** includes a central processing unit (CPU) that integrally controls the sections of the printing apparatus **1**, a universal asynchronous receiver transmitter (UART) that manages input and output, a field programmable gate array (FPGA) or a programmable logic device (PLD) that is a logic circuit, and the like. The CPU is also referred to as a processor.

(15) The first storage section **12** includes a flash read only memory (ROM) or a hard disk drive (HDD) which is a rewritable nonvolatile memory, a random access memory (RAM) which is a volatile memory, and the like.

(16) The CPU of the first control section **11** reads a program such as firmware and setting information stored in the nonvolatile memory of the first storage section **12**, and executes the program by using the RAM of the first storage section **12** as a work area.

(17) The printing section **14** includes the head **15***a* and the roller **15***b*. Recording paper PA to be described later is, for example, a long thermal paper. The head **15***a* is, for example, a line thermal head. The first control section **11** rotates the roller **15***b* to transport the recording paper PA, and drives the head **15***a* to perform printing on the recording paper PA.

(18) The cutter **16** has a movable cutting blade. The first control section **11** moves the cutting blade to cut the recording paper PA. The printed and cut recording paper PA is issued as a receipt to be given to a customer in a store, a slip instructing cooking in a kitchen of a restaurant, or the like.

(19) The first control section **11** can adjust a distance of movement with respect to a movable range of the cutting blade of the cutter **16**.

(20) Accordingly, the first control section **11** can perform so-called full-cut in which the cutting blade is sufficiently moved with respect to the movable range to completely cut and separate the recording paper PA. In addition, the first control section **11** can perform so-called partial cut in which the cutting blade is moved to the middle of the movable range to partially cut the recording paper PA.

(21) The fully cut receipt is in a form that can be easily handed to the customer by the staff. On the other hand, since the partially cut slip is partially linked to the long recording paper PA, the slip does not fall from the printing apparatus **1**, and even when the staff does not take out the slip, the slip does not fall on the floor of the kitchen and is not scattered.

(22) The communication section **13** includes a circuit, a substrate, or the like that can communicate with the external apparatus **4** such as a computer or a tablet terminal. The communication section **13** may have, for example, a connector, and may conform to a Universal Serial Bus (USB) which is a wired serial communication method. In addition, the communication section **13** may have, for example, an antenna, and may conform to Ethernet ((registered trademark), IEEE802.3) which is a wireless network communication method.

(23) As described later, when the first control section **11** receives print data via the communication section **13**, the first control section **11** controls the head **15***a* and the roller **15***b* of the printing section **14** to perform printing on the recording paper PA.

(24) When the first control section **11** receives a cut command via the communication section **13**, the first control section **11** controls the cutter **16** to cut the recording paper PA.

(25) The CN **18** is, for example, a modular jack having six poles, and is a connector so-called RJ-11. The CN **18** can be coupled to any one of the first peripheral apparatus **2** and a second peripheral apparatus **3** described later.

(26) As will be described later, the driving circuit **17** can transmit and receive predetermined information or signals to and from the first peripheral apparatus **2** via the CN **18**. The driving

circuit **17** is the same for the second peripheral apparatus **3**.
(27) The first peripheral apparatus **2** can operate by receiving supply of electric power from the printing apparatus **1** via the CN **18**. The same applies to the second peripheral apparatus **3**.
(28) The power supply **19** can generate and output a voltage of, for example, substantially +24 V or substantially +3.3 V. Hereinafter, +24 V will be simply referred to as 24 V, and +3.3 V will be simply referred to as 3.3 V. Further, when a current or a voltage is represented, "substantially" is omitted.
(29) The power supply **19** can supply 24 V so as to drive so-called actuators such as the printing section **14** including the head **15***a* and the roller **15***b*, the cutter **16**, and the driving circuit **17**. In addition, the power supply **19** can supply 3.3 V to logic circuits such as the first control section **11**, the first storage section **12**, and the communication section **13**. Further, the power supply **19** can supply 24 V to the first peripheral apparatus **2** and the second peripheral apparatus **3** via the CN **18**.
(30) In the example illustrated in FIG. **1**, the printing apparatus **1** is configured to issue a slip instructing cooking in the kitchen. In this case, the first peripheral apparatus **2** may be, for example, a ringing apparatus having a function of ringing. The printing apparatus **1** can cause the first peripheral apparatus **2** to ring, which is driving.
(31) By the ringing of the first peripheral apparatus **2**, it is possible to notify the staff that the printing apparatus **1** issued a slip. In this way, by configuring the first peripheral apparatus **2** to ring by using the printing apparatus **1** that issues a slip, the staff can easily notice that a slip was issued. The staff can immediately take out the slip from the printing apparatus **1** and perform cooking. At this time, the printing apparatus **1** may partially cut the slip.
(32) FIG. **2** illustrates an arrangement of the head **15***a* and the roller **15***b* of the printing section **14**, the cutter **16**, and the like. The long recording paper PA is wound as roll paper PB. The roller **15***b* is located at a position facing the head **15***a* via the recording paper PA, and is also referred to as a platen.
(33) The recording paper PA is pinched between the head **15***a* and the roller **15***b*. Under the control of the first control section **11**, the roller **15***b* pulls out the recording paper PA from the roll paper PB and transports the recording paper PA in a transport direction FF.
(34) The head **15***a*, the roller **15***b*, and the cutter **16** are disposed from upstream to downstream in the transport direction FF. The position of the head **15***a* and the position of the cutter **16** are separated from each other by a distance of a gap GP along the transport direction FF.
(35) Due to the gap GP, the recording paper PA printed by the head **15***a* needs to be cut after being transported to the position of the cutter **16**. This is because when the printed recording paper PA is cut without being transported to the position of the cutter **16**, the printed recording paper PA is cut at a position in the middle thereof and no longer functions as the receipt or slip.
(36) Next, a configuration in which the printing apparatus **1** drives the first peripheral apparatus **2** will be described with reference to FIG. **3**. For convenience of description, the driving circuit **17** and the CN **18** are mainly illustrated on the printing apparatus **1** side.
(37) The printing apparatus **1** is coupled to the first peripheral apparatus **2** by a modular cable or the like via the CN **18**.
(38) The first peripheral apparatus **2** includes a second control section **21**, a second storage section **22**, a buzzer **23**, and a voltage converter **24**. Similarly to the first control section **11**, the second control section **21** includes a CPU and the like, and similarly to the first storage section **12**, the second storage section **22** includes a nonvolatile memory, a volatile memory, and the like.
(39) The second storage section **22** may be incorporated in the second control section **21**. The buzzer **23** may also be incorporated in the second control section **21**.
(40) The voltage converter **24** of the first peripheral apparatus **2** can convert 24 V supplied from the printing apparatus **1** into 3.3 V and supply 3.3 V to the second control section **21**, the second storage section **22**, and the like, which are logic circuits.
(41) When the buzzer **23** is driven by 3.3 V, the buzzer **23** is configured to receive supply of 3.3 V

from the voltage converter **24**. In addition, when the buzzer **23** is driven by 24 V, the buzzer **23** is configured to receive supply of 24 V from the printing apparatus **1**. When the second control section **21**, the second storage section **22**, and the like are also driven by 24 V, the voltage converter **24** may be omitted.

(42) In this way, the first peripheral apparatus **2** can be driven by receiving the supply of electric power from the printing apparatus **1**.

(43) The first control section **11** of the printing apparatus **1** has output ports P**1** and P**2**, and has an input port IN.

(44) The second control section **21** of the first peripheral apparatus **2** has output ports OUT and S, and input ports R and CLK. The second control section **21** can output a ringing signal from the output port OUT to the buzzer **23** to cause the buzzer **23** to ring.

(45) The driving circuit **17** of the printing apparatus **1** has transistors TR**1** and TR**2**. The transistors TR**1** and TR**2** can be driven by 24 V.

(46) A base of the transistor TR**1** and a base of the transistor TR**2** are respectively coupled to the output ports P**1** and P**2** of the first control section **11**. The first control section **11** outputs a Clock signal from the output port P**2**, and outputs predetermined information as a Data signal from the output port P**1** in synchronization with the Clock signal.

(47) The Data signal and the Clock signal respectively input to the base of the transistor TR**1** and the base of the transistor TR**2** are amplified by using 24 V, and are transmitted from respective collectors to the first peripheral apparatus **2** via the CN **18**.

(48) The Data signal includes a drive command, and when the first peripheral apparatus **2** is a ringing apparatus, the Data signal includes a ringing command.

(49) The CN **18** is a connector having terminals of six poles, and the terminals are numbered **1** to **6**.

(50) A terminal **1** of the CN **18** is coupled to respective grounds of the printing apparatus **1** and the first peripheral apparatus **2** to adjust a potential.

(51) A terminal **2** of the CN **18** transmits the amplified Data signal from the printing apparatus **1** to the first peripheral apparatus **2**. At this time, a terminal **5** of the CN **18** transmits the amplified Clock signal synchronized with the Data signal from the printing apparatus **1** to the first peripheral apparatus **2**.

(52) A terminal **3** of the CN **18** transmits a status signal from the output port S of the first peripheral apparatus **2** to the printing apparatus **1**. The status signal is input to the input port IN of the first control section **11**. The status signal is, for example, a signal indicating that the buzzer **23** is ringing. The first control section **11** can determine that the buzzer **23** is ringing based on the status signal input to the input port IN.

(53) A terminal **4** of the CN **18** supplies 24 V from the printing apparatus **1** to the first peripheral apparatus **2**. A terminal **6** of the CN **18** couples the ground of the printing apparatus **1** and a ground port G of the second control section **21** of the first peripheral apparatus **2** to match ground levels of the both.

(54) The second control section **21** of the first peripheral apparatus **2** receives the Data signal and the Clock signal transmitted from the printing apparatus **1** from the input ports R and CLK respectively. The second control section **21** can receive the Data signal from the input port R in accordance with the timing of the Clock signal received from the input port CLK, and can acquire a ringing command from the Data signal. As described above, the printing apparatus **1** and the first peripheral apparatus **2** can perform so-called serial communication in which communication is performed in synchronization with the Clock signal.

(55) The second control section **21** can generate a ringing signal based on the acquired ringing command and output the ringing signal from the output port OUT to the buzzer **23** to cause the buzzer **23** to ring.

(56) The first peripheral apparatus **2** may convert the Data signal and the Clock signal into 3.3 V by using the voltage converter **24**.

(57) 1-2. Method for Controlling Printing Apparatus to Which First Peripheral Apparatus is Coupled

(58) Next, a method for controlling printing, cutting, and driving of the first peripheral apparatus **2** by the printing apparatus **1** will be described with reference to FIGS. **4** and **5**. The first peripheral apparatus **2** coupled to the printing apparatus **1** is, for example, a ringing apparatus.

(59) First, it is assumed that order information of a series of dishes is input to the external apparatus **4**. In accordance with the order information of the series of dishes, the external apparatus **4** generates a series of pieces of print data including "Cooking A**0** . . . A**9**" that is print data A instructing cooking A, "Cooking B**0** . . . B**9**" that is print data B instructing cooking B, "Cooking C**0** . . . C**9**" that is print data C instructing cooking C, and "Cooking D**0** . . . D**9**" that is print data D instructing cooking D. Then, the external apparatus **4** adds cut commands to respective pieces of print data and generates transaction information.

(60) Here, the transaction information indicates information related to a series of processes. In the embodiment, the transaction information includes a plurality of pieces of print data and a plurality of cut commands described above.

(61) The external apparatus **4** collectively transmits the transaction information to the printing apparatus **1** in order to perform a series of processes for instructing cooking. The printing apparatus **1** collectively receives the transaction information by the communication section **13**. The transaction information received by the printing apparatus **1** is referred to as reception information.

(62) For specific description in FIG. **4**, it is assumed that the external apparatus **4** sequentially transmits the plurality of pieces of print data and the plurality of cut commands included in the transaction information in the above-described order. Further, it is assumed that the printing apparatus **1** sequentially receives the plurality of pieces of print data and the plurality of cut commands included in the reception information in the above-described order.

(63) As illustrated in FIG. **4**, first, the external apparatus **4** transmits the print data A and a cut command A included in the transaction information to the printing apparatus **1** (S**101**).

(64) The first control section **11** of the printing apparatus **1** receives the print data A by the communication section **13**, and executes print DA for printing the print data A on the recording paper PA by the printing section **14** (S**102**).

(65) Next, the first control section **11** receives the cut command A by the communication section **13**, and executes cut CA for cutting the recording paper PA with the cutter **16** (S**103**). At this time, the first control section **11** generates a ringing command BA in conjunction with the execution of the cut CA and transmits the ringing command BA to the first peripheral apparatus **2** via the CN **18** (S**103**).

(66) The second control section **21** of the first peripheral apparatus **2** receives the ringing command BA via the CN **18**, and executes ringing A for causing the buzzer **23** to ring (S**104**).

(67) As described above, the first control section **11** of the printing apparatus **1** generates the ringing command BA in conjunction with the execution of the cut CA, and transmits the ringing command BA to the first peripheral apparatus **2** to execute the ringing A. Therefore, the external apparatus **4** does not need to transmit a command corresponding to the ringing command BA to the printing apparatus **1**.

(68) Similarly, next, the external apparatus **4** transmits the print data B and a cut command B to the printing apparatus **1** (S**105**). The first control section **11** of the printing apparatus **1** executes print DB for printing the received print data B by the printing section **14** (S**106**).

(69) Next, the first control section **11** executes cut CB by the cutter **16** based on the received cut command B (S**107**). At this time, the first control section **11** generates a ringing command BB in conjunction with the execution of the cut CB and transmits the ringing command BB to the first peripheral apparatus **2** (S**107**).

(70) The second control section **21** of the first peripheral apparatus **2** executes ringing B for causing the buzzer **23** to ring based on the received ringing command BB (S**108**).

(71) Similarly, next, the external apparatus **4** transmits the print data C and a cut command C to the printing apparatus **1** (S**109**). The first control section **11** of the printing apparatus **1** executes print DC for printing the received print data C by the printing section **14** (S**110**).
(72) Next, the first control section **11** executes cut CC by the cutter **16** based on the received cut command C (S**111**). At this time, the first control section **11** generates a ringing command BC in conjunction with the execution of the cut CC and transmits the ringing command BC to the first peripheral apparatus **2** (S**111**).
(73) The second control section **21** of the first peripheral apparatus **2** executes ringing C for causing the buzzer **23** to ring based on the received ringing command BC (S**112**).
(74) Next, the external apparatus **4** transmits the print data D and a cut command D to the printing apparatus **1** (S**113**). The first control section **11** of the printing apparatus **1** executes print DD for printing the received print data D by the printing section **14** (S**114**).
(75) Here, since the transmission of the transaction information is completed, the external apparatus **4** enters a no-transmission-data state (S**115**).
(76) When the first control section **11** detects that there is no next reception in the communication section **13** and there is no reception information, the first control section **11** temporarily suspends execution of cut CD based on the last cut command D of the received reception information (S**116**). In addition, the first control section **11** does not transmit a ringing command BD, which is supposed to be in conjunction with the execution of the cut CD, to the first peripheral apparatus **2**. The cut command D is the last cut command included in the reception information.
(77) As illustrated in FIG. **2**, there is a gap GP between the head **15***a* and the cutter **16**. For this reason, when the first control section **11** executes the print DD, as illustrated in FIG. **5** to be described later, a print result DD printed on the recording paper PA is not transported to the position of the cutter **16**. When the cut CD is executed in this state and the recording paper PA is cut, the recording paper PA is cut at a position in the middle of the print result DD.
(78) Therefore, when the first control section **11** detects that there is no next reception information, the first control section **11** suspends the execution of the cut CD.
(79) FIG. **5** illustrates a print result AD on the recording paper PA obtained by executing the method for controlling the printing apparatus **1** illustrated in FIG. **4**. FIG. **5** illustrates that the staff does not take out the slip and the print result AD remains in the printing apparatus **1**. The cutter **16** is located at a position shifted from the head **15***a* in the transport direction FF. A distance between them is the gap GP.
(80) In FIG. **5**, for example, a result obtained by executing and printing the print DA related to "Cooking A**0** . . . A**9**" that is the print data A on the recording paper PA is illustrated as a print result DA. Hereinafter, similarly, a print result DB to a print result DD are illustrated.
(81) Further, for example, a cut result obtained by executing the cut CA on the recording paper PA is illustrated as a cut result CA in FIG. **5**. Hereinafter, similarly, a cut result CB to a cut result CC are illustrated.
(82) Further, for example, the transmission of the ringing command BA in conjunction with the cut CA and ringing are illustrated as ringing command transmission BA in FIG. **5** at the position of the cut result CA for convenience. Hereinafter, similarly, ringing command transmission BB to ringing command transmission BC are illustrated.
(83) As illustrated in FIG. **5**, since there is a gap GP between the head **15***a* and the cutter **16**, the position of the print result DD does not exceed the position of the cutter **16** after the first control section **11** executes the print DD.
(84) Therefore, after executing the print DD, the first control section **11** suspends the execution of the cut CD corresponding to the received cut command D. The first control section **11** also suspends the transmission of the ringing command BD. In the reception information, the print data D is the last print data, and the cut command D is the last cut command.
(85) Next, as illustrated in FIG. **6**, it is assumed that the order information of the next dish is not

input to the external apparatus **4** and the no-transmission-data state continues (S**201**).
(86) When the first control section **11** of the printing apparatus **1** determines that there is no next reception in the communication section **13**, a state in which there is no reception information (S**202**) continues, and a predetermined period of time elapses (S**203**), the first control section **11** sets a flag (S**204**). The predetermined period of time is, for example, about two seconds.
(87) At this time, the first control section **11** can determine that the transaction information, which is the reception information, comes to an end.
(88) Here, the setting of the flag specifically indicates that the first control section **11** stores information indicating that the state in which there is no reception information continues and the predetermined period of time elapses in the first storage section **12**.
(89) For example, the first control section **11** writes a value of "1" as a flag in a predetermined area of the first storage section **12**, where the value is "0" in an initial state.
(90) When the first control section **11** reads the predetermined area of the first storage section **12** later and the value is "1", it is determined that the flag is set, and it can be determined that the state in which there is no reception information continues and the predetermined period of time elapses.
(91) In addition, after the power supply **19** of the printing apparatus **1** is turned on, the first control section **11** may set the flag also when the first control section **11** determines that there is no reception in the communication section **13**, a state in which there is no reception information continues, and a predetermined period of time elapses.
(92) That is, in this case, the first control section **11** does not receive the reception information including the print data A to the print data D, the cut commands, and the like in advance. The first control section **11** may set the flag and perform a process in the same manner as described later when there is no reception in the communication section **13** and a predetermined period of time elapses even though the reception information is not received in advance.
(93) The first control section **11** causes the roller **15***b* to transport the recording paper PA in the transport direction FF by a distance corresponding to the gap GP which is a predetermined distance (S**205**).
(94) This result is illustrated as a print result DG in FIG. **7**. The position of the print result DD on the recording paper PA can exceed the position of the cutter **16**. In this case, since it is sufficient that the position of the print result DD exceeds the position of the cutter **16**, the first control section **11** may transport the recording paper PA by the distance of the gap GP or more. In FIG. **7**, only the print result DD is illustrated for convenience.
(95) Then, the first control section **11** executes the suspended cut CD (S**206**). As illustrated in FIG. **7**, the print result DD is cut at a position that exceeds the position of the cutter **16**, and becomes a cut result CD. The print result DD can be issued in a form of a slip without being cut in the middle.
(96) At this time, the first control section **11** transmits the suspended ringing command BD to the first peripheral apparatus **2** in conjunction with the execution of the cut CD (S**206**), and causes the first peripheral apparatus **2** to execute ringing D (S**207**). The cut result CD and ringing command transmission BD are illustrated at the position of the cutter **16** in FIG. **7**.
(97) The staff can ascertain that the print DD was issued by the ringing D of the first peripheral apparatus **2**, and can take out the cut print result DD from the printing apparatus **1**.
(98) At this time, the area of the gap GP on the recording paper PA becomes a not-printed blank area due to the transport. The first control section **11** may cause the printing section **14** to print a message indicating that the transaction information comes to an end, instead of generating a blank by transporting the recording paper PA by the distance of the gap GP.
(99) Next, it is assumed that order information of the next series of dishes is input to the external apparatus **4**. As illustrated in FIG. **8**, according to the order information of the next series of dishes, the external apparatus **4** generates respective pieces of print data of "Cooking E**0** . . . E**9**" that is print data E instructing cooking E, "Cooking F**0** . . . F**9**" that is print data F instructing cooking F, "Cooking G**0** . . . G**9**" that is print data G instructing cooking G, and "Cooking H**0** . . . H**9**" that is

print data H instructing cooking H. Then, the external apparatus **4** adds cut commands to the respective pieces of print data to generate next transaction information.
(100) As in the case of FIG. **4** described above, the external apparatus **4** transmits the next transaction information to the printing apparatus **1** also in the case of FIG. **8**. The printing apparatus **1** receives next reception information, which is the next transaction information, by the communication section **13**.
(101) Also in FIG. **8**, for specific description, it is assumed that the external apparatus **4** sequentially transmits the plurality of pieces of print data and the plurality of cut commands included in the next reception information in the above-described order.
(102) In addition, it is assumed that the printing apparatus **1** sequentially receives and processes the plurality of pieces of print data and the plurality of cut commands included in the next reception information in the above-described order.
(103) As illustrated in FIG. **8**, the external apparatus **4** transmits the first print data E and a cut command E included in the next transaction information to the printing apparatus **1** (S**301**).
(104) The first control section **11** of the printing apparatus **1** receives the print data E and the cut command E by the communication section **13**.
(105) At this time, the first control section **11** reads the value in the predetermined area of the first storage section **12** in which the flag is written. The first control section **11** executes a flag check for checking whether the value is "1" indicating that the flag is set (S**302**). When the first control section **11** reads the value of "1" indicating that a flag is set, the first control section **11** determines that the state in which there is no reception information continues and the predetermined period of time elapses.
(106) As a result of the determination, the first control section **11** transmits a ringing command to the first peripheral apparatus **2** via the CN **18** based on at least one cut command included in the next reception information, and executes a process of ringing. The first control section **11** does not transmit the ringing command to the first peripheral apparatus **2** based on another cut command included in the next reception information.
(107) In this example, it is assumed that the first control section **11** determines that one cut command is the cut command E which is the first cut command included in the next reception information and processes the cut command. Further, the first control section **11** determines that a cut command other than the cut command E is another cut command.
(108) When the first control section **11** reads a value of "0" indicating that the flag is not set, the first control section **11** determines that the state in which there is no reception information has not continued for the predetermined period of time. The first control section **11** can determine that the process illustrated in FIG. **6** is not performed.
(109) In this case, after executing print DE of the first print data E included in the next reception information, the first control section **11** executes the suspended cut CD and the ringing command BD. Thereafter, the first control section **11** performs the same process as in the case of FIG. **4** described above based on the cut command included in the next reception information.
(110) The description of the process when the flag is set will be continued. As illustrated in FIG. **8**, the first control section **11** of the printing apparatus **1** receives the print data E by the communication section **13**, and executes the print DE for printing the print data E on the recording paper PA by the printing section **14** (S**303**).
(111) Next, the first control section **11** executes cut CE for cutting the recording paper PA with the cutter **16** based on the received cut command E (S**304**). At this time, the first control section **11** processes one cut command as the cut command E. Specifically, the first control section **11** generates a ringing command BE in conjunction with the execution of the cut CE, and transmits the ringing command BE to the first peripheral apparatus **2** via the CN **18** (S**304**).
(112) The second control section **21** of the first peripheral apparatus **2** receives the ringing command BE via the CN **18**, and executes ringing E for causing the buzzer **23** to ring (S**305**).

(113) Next, the external apparatus **4** transmits the print data F and a cut command F to the printing apparatus **1** (S**306**). The first control section **11** of the printing apparatus **1** executes print DF for printing the received print data F by the printing section **14** (S**307**).
(114) Next, the first control section **11** executes cut CF by the cutter **16** based on the received cut command F (S**308**). At this time, the first control section **11** determines that the cut command F is another cut command, and processes the cut command F. Specifically, the first control section **11** does not generate a ringing command in conjunction with the execution of the cut CF, and does not transmit a ringing command to the first peripheral apparatus **2** via the CN **18**.
(115) Next, the external apparatus **4** transmits the print data G and a cut command G to the printing apparatus **1** (S**309**). The first control section **11** of the printing apparatus **1** executes print DG for printing the received print data G by the printing section **14** (S**310**).
(116) Next, the first control section **11** executes cut CG by the cutter **16** based on the received cut command G (S**311**). At this time, the first control section **11** determines that the cut command G is another cut command, does not generate a ringing command, and does not transmit a ringing command to the first peripheral apparatus **2**.
(117) Next, the external apparatus **4** transmits the print data H and a cut command H to the printing apparatus **1** (S**312**). The first control section **11** of the printing apparatus **1** executes print DH for printing the received print data H by the printing section **14** (S**313**).
(118) Here, since the transmission of the transaction information is completed, the external apparatus **4** enters the no-transmission-data state (S**314**).
(119) When the first control section **11** detects that there is no next reception in the communication section **13** and there is no reception information, the first control section **11** temporarily suspends execution of cut CH based on the received cut command H (S**315**). The cut command H is the last cut command included in the next reception information.
(120) In this case, similarly to the case illustrated in FIG. **6**, when there is no next reception and a predetermined period of time elapses, the first control section **11** executes the suspended cut CH after transporting the recording paper PA by the distance of the gap GP.
(121) The first control section **11** determines that the cut command H is another cut command, does not generate a ringing command, and does not transmit a ringing command to the first peripheral apparatus **2** in the execution of the suspended cut CH.
(122) At this time, the first control section **11** may generate a ringing command BH in conjunction with the execution of the cut CH, transmit the ringing command BH to the first peripheral apparatus **2**, and cause the first peripheral apparatus **2** to ring.
(123) Since the predetermined period of time elapses, the staff is less likely to feel annoyed. On the contrary, as in the case of the print result DD described above, the staff can ascertain that the print DH was issued, and can take out a cut print result DH from the printing apparatus **1**.
(124) Here, the first control section **11** sets one cut command as the cut command E which is the first cut command included in the reception information. The first control section **11** can assign a cut command in any order as one cut command. For example, the first control section **11** may set one cut command as the cut command F which is the second cut command included in the reception information. In addition, the first control section **11** may set one cut command as any combination of two or more cut commands included in the reception information.
(125) In this way, when issuing a slip, the first control section **11** can cause the buzzer **23** of the first peripheral apparatus **2** to ring a specific number of times, such as once. The first control section **11** does not cause the buzzer **23** to ring every time a slip is issued, and can therefore prevent the staff from feeling annoyed.
(126) FIG. **9** illustrates a print result EH on the recording paper PA obtained by executing the method for controlling the printing apparatus **1** illustrated in FIG. **8** in the same manner as the print result AD illustrated in FIG. **5**.
(127) In FIG. **9**, a result obtained by executing the print DE related to “Cooking E**0** . . . E**9**” that is

the print data E on the recording paper PA is illustrated as a print result DE. Hereinafter, similarly, a print result DF to a print result DH are illustrated.
(128) In addition, a result obtained by executing the cut CE on the recording paper PA is illustrated as a cut result CE. Hereinafter, similarly, a cut result CF to a cut result CG are illustrated.
(129) Further, the transmission of the ringing command BE is executed in conjunction with the execution of the cut CE corresponding to the cut command E which is one cut command. For convenience, this is illustrated as ringing command transmission BE at the position of the cut result CE. The ringing command transmission is not performed in the cut result CF and the cut result CG respectively corresponding to the cut command F that is another cut command and the cut command G that is another cut command.
(130) Since there is a gap GP between the head **15***a* and the cutter **16**, the position of the print result DH does not exceed the position of the cutter **16** after the first control section **11** executes the print DH.
(131) As a result, after executing the print DH, the first control section **11** suspends execution of the cut CH corresponding to the received cut command H. When the cut command H is one cut command, the first control section **11** also suspends the transmission of the ringing command BH.
(132) Here, an aspect of the ringing command will be described. As a first example of the ringing command, there is an aspect in which a waveform of a ringing signal for causing the buzzer **23** of the first peripheral apparatus **2** to ring is designated. Specifically, the ringing command includes information for designating an ON time and an OFF time for causing the buzzer **23** to ring. In this case, the ringing command may include information designating a number of times the ON time and the OFF time are repeated.
(133) Based on the ringing command, the first control section **11** of the printing apparatus **1** generates a waveform related to the ON time and the OFF time for causing the buzzer **23** to ring as a Data signal which is the ringing command, and transmits the Data signal to the first peripheral apparatus **2**. In this case, the first control section **11** may not output a Clock signal.
(134) The first peripheral apparatus **2** can directly turn on and off the buzzer **23** according to the waveform of the received Data signal to drive, and cause the buzzer **23** to ring. In this case, the second control section **21** of the first peripheral apparatus **2** may not perform a process of generating a ringing signal. Further, the first peripheral apparatus **2** may not include the second control section **21**.
(135) In the first example of the ringing command, an aspect may be adopted in which the OFF time is fixed and the OFF time is not included.
(136) As a second example of the ringing command, there is an aspect including scale information related to the ringing of the buzzer **23** of the first peripheral apparatus **2** and time information related to the ringing.
(137) The first control section **11** of the printing apparatus **1** generates the scale information and the time information as a Data signal which is a ringing command, based on the ringing command, and transmits the Data signal to the first peripheral apparatus **2** in synchronization with a Clock signal.
(138) In this case, the second storage section **22** of the first peripheral apparatus **2** stores in advance information of a drive signal corresponding to the scale information related to the ringing of the buzzer **23**. The second control section **21** can read the information of the drive signal corresponding to the designated scale information from the second storage section **22** based on the received ringing command, generate a drive signal, and cause the buzzer **23** to ring according to a period of the designated time information.
(139) In the second example of the ringing command, as compared with the first example of the ringing command, the first control section **11** of the printing apparatus **1** causes the buzzer **23** to ring, and thus it is not necessary to generate information of a complicated waveform. Furthermore, the first control section **11** does not need to continuously transmit the ringing command while the buzzer **23** is ringing. The first control section **11** can quickly end the process related to the ringing

and execute the next process.
(140) As a third example of the ringing command, there is an aspect including melody information related to the ringing of the buzzer **23** of the first peripheral apparatus **2**. For example, the melody information includes information for designating a melody.
(141) The first control section **11** of the printing apparatus **1** generates the melody information as a Data signal which is a ringing command based on the ringing command, and transmits the Data signal to the first peripheral apparatus **2** in synchronization with a Clock signal.
(142) In this case, the second storage section **22** of the first peripheral apparatus **2** stores in advance detailed information corresponding to the melody information, such as a series of scales and times for causing the buzzer **23** to ring as the designated melody.
(143) The second control section **21** can read the detailed information corresponding to the designated melody from the second storage section **22** based on the received ringing command, generate a drive signal, and cause the buzzer **23** to ring.
(144) In the third example of the ringing command, as compared with the first example of the ringing command, the first control section **11** of the printing apparatus **1** does not need to generate information of a complicated waveform to cause the buzzer **23** to ring. Furthermore, the first control section **11** does not need to continuously transmit the ringing command while the buzzer **23** is ringing. The first control section **11** can quickly end the process related to the ringing and execute the next process.
(145) Further, in the second example of the ringing command, when the first control section **11** of the printing apparatus **1** causes the buzzer **23** to ring a melody, the first control section **11** of the printing apparatus **1** needs to generate information for designating a series of scales and lengths related to the melody and transmit the information to the first peripheral apparatus **2**.
(146) In the third example of the ringing command, the first control section **11** only needs to designate a melody, and does not need to transmit information on a series of scales and times related to the melody. The first control section **11** can quickly end the process related to the ringing and execute the next process.
(147) 1-3. Printing Apparatus to Which Second Peripheral Apparatus is Coupled
(148) A POS system may be provided with the second peripheral apparatus **3**, which is a cash drawer for storing money or the like.
(149) FIG. **10** illustrates a case where the second peripheral apparatus **3** is coupled to the printing apparatus **1** instead of the first peripheral apparatus **2** illustrated in FIG. **3**.
(150) A configuration in which the printing apparatus **1** drives the second peripheral apparatus **3** will be described with reference to FIG. **10**. The printing apparatus **1** is coupled to the second peripheral apparatus **3** via the CN **18** by a modular cable or the like.
(151) The second peripheral apparatus **3** has a drawer (not illustrated), plungers L**1** and L**2**, a hook (not illustrated), a spring (not illustrated), and a switch SW. The plungers L**1** and L**2** are actuators including an electromagnet and are coupled to the hook. The drawer is locked by the hook when closed. The drawer is configured to be locked by the hook when the staff pushes the drawer closed. The spring is then compressed by the closed drawer.
(152) When the plungers L**1** and L**2** of the second peripheral apparatus **3** are driven, the hook locking the corresponding drawer is released, and the drawer is opened by the force of expansion of the spring. Hereinafter, driving the plungers L**1** and L**2** is also referred to as driving the second peripheral apparatus **3**.
(153) In a store, two staff members may use and manage individual drawers in the same second peripheral apparatus **3** respectively. Therefore, in this example, the second peripheral apparatus **3** has two drawers, and the plungers L**1** and L**2** are provided so as to correspond to the respective drawers.
(154) In order to drive the plungers L**1** and L**2**, for example, it is necessary to apply electric power of about 24 V and 1 A. The power supply **19** of the printing apparatus **1** has electric power capable

of driving the plungers L**1** and L**2**. Therefore, in the POS system, the second peripheral apparatus **3** is coupled to the printing apparatus **1**.
(155) In addition, since the second peripheral apparatus **3** is disposed near the printing apparatus **1**, the staff of the store can give the receipt issued by the printing apparatus **1** to the customer, open/close the drawer of the second peripheral apparatus **3**, and receive and give cash from and to the customer.
(156) When the communication section **13** of the printing apparatus **1** receives a drive command for the second peripheral apparatus **3** from the external apparatus **4**, the first control section **11** generates drive signals T**1** and T**2** for driving the plungers L**1** and L**2**, and outputs the drive signals T**1** and T**2** from output ports P**1** and P**2**. The drive signals T**1** and T**2** are signals having periods T**1** and T**2** of a high-level voltage respectively. The first control section **11** does not output the drive signals T**1** and T**2** at the same time, but outputs one of the drive signals T**1** and T**2** based on an instruction of the drive command for the second peripheral apparatus **3**. The periods T**1** and T**2** are, for example, 100 msec to 200 msec.
(157) The drive signals T**1** and T**2** output from the first control section **11** are respectively amplified by transistors TR**1** and TR**2** by using 24 V, and are transmitted from respective collectors to the second peripheral apparatus **3** via the terminals **2** and **5** of the CN **18**.
(158) The terminals **2** and **5** of the CN **18** are coupled to respective one ends of the respective plungers L**1** and L**2**. The respective other ends of the plungers L**1** and L**2** are coupled to the terminal **4** of the CN **18**, and 24 V is supplied from the printing apparatus **1**.
(159) The plungers L**1** and L**2** are driven by the drive signals T**1** and T**2** and can open the corresponding drawers. At this time, in the plungers L**1** and L**2**, for example, a current of 1 A at 24 V flows over the period of 100 msec to 200 msec.
(160) The terminal **1** of the CN **18** is coupled to respective grounds of the printing apparatus **1** and the second peripheral apparatus **3** to adjust the potential.
(161) The switch SW is configured to be in an open state when one of the two drawers is opened, and to be in a closed state when both of the two drawers are closed.
(162) One end of the switch SW is coupled to the ground level of the printing apparatus **1** via the terminal **6** of the CN **18**. The other end of the switch SW is coupled to the input port IN of the first control section **11** of the printing apparatus **1** via the terminal **3** of the CN **18**.
(163) The input port IN is pulled up to 3.3 V. Therefore, the first control section **11** can determine that the switch SW is in the open state when detecting 3.3 V, which is a high-level voltage, at the input port IN. That is, the first control section **11** can determine that one of the two drawers is open.
(164) On the other hand, the first control section **11** can determine that the switch SW is in the closed state when the input port IN detects the ground level which is a low-level voltage. That is, the first control section **11** can determine that both of the two drawers are closed.
(165) According to the above-described embodiment, the first control section **11** of the printing apparatus **1** receives the reception information, which is the transaction information including the plurality of pieces of print data and the plurality of cut commands, from the external apparatus **4** by the communication section **13**. When there is no next reception for a predetermined period of time after receiving the reception information, the first control section **11** transmits a drive command to the first peripheral apparatus **2** via the CN **18** based on at least one cut command included in the reception information to drive the first peripheral apparatus **2**. On the other hand, the first control section **11** does not transmit the drive command to the first peripheral apparatus **2** based on another cut command included in the reception information.
(166) With this configuration, when the first peripheral apparatus **2** is a ringing apparatus, the printing apparatus **1** does not cause the first peripheral apparatus **2** to ring every time a slip is issued, and thus it is possible to prevent the staff from feeling annoyed.
(167) Although the present embodiment is described in detail with reference to the drawings, the specific configuration is not limited to the embodiment, and changes, substitutions, deletions, and

the like may be made without departing from the gist of the present disclosure.
(168) The head **15***a* of the printing apparatus **1** is described using a line thermal head as an example, but the printing method is not limited. For example, an ink jet head may be used.
(169) The first peripheral apparatus **2** may cause the buzzer **23** to ring in a self-excited manner or in a separately-excited manner.
(170) The first peripheral apparatus **2** is described using a ringing apparatus as an example, but it may be a display apparatus. In addition, the second peripheral apparatus **3** is described using a cash drawer as an example, but it may be a change machine.
(171) In the above-described embodiment, the first control section **11** of the printing apparatus **1** sets a flag when there is no reception in the communication section **13** and a predetermined period of time elapses. Instead of a flag, a memory switch may be set in a predetermined area of the first storage section **12**, and the first control section **11** may write “1” in the memory switch based on a command designating “1” in the memory switch from the external apparatus **4** and perform the same process. In this case, the value may not be “1” and may be any value that can be identified by the first control section **11**.

Claims

1. A printing apparatus comprising: a communication circuit configured to communicate with an external apparatus and receive print data and a cut command; a connector configured to be coupled to any one of a first peripheral apparatus and a second peripheral apparatus; a head configured to print the print data on recording paper; a cutter configured to cut the recording paper based on the cut command; and a controller configured to control the head and the cutter, wherein the controller is configured to after no reception for a predetermined period of time since the communication circuit has received information including a plurality of pieces of print data and a plurality of cut commands, transmit a drive command to the first peripheral apparatus via the connector based on at least one cut command among the cut commands included in the reception information to drive the first peripheral apparatus, and not transmit the drive command to the first peripheral apparatus based on another cut command.
2. The printing apparatus according to claim 1, further comprising: a roller configured to transport the recording paper, wherein the controller is configured to when there is no reception by the communication circuit for the predetermined period of time, after the recording paper is transported by a predetermined distance by the roller, cut the recording paper based on a last cut command included in the reception information.
3. The printing apparatus according to claim 2, wherein the predetermined distance is a distance between the head and the cutter.
4. The printing apparatus according to claim 1, wherein the one cut command is a first cut command included in the reception information.
5. The printing apparatus according to claim 1, wherein the connector is configured to be coupled to the second peripheral apparatus different from the first peripheral apparatus, and the controller is configured to generate a drive signal when a drive command for the second peripheral apparatus is received by the communication circuit, and transmit the drive signal to the second peripheral apparatus via the connector to drive the second peripheral apparatus.
6. The printing apparatus according to claim 5, wherein the first peripheral apparatus is a ringing apparatus, and the second peripheral apparatus is a cash drawer.
7. A method for controlling a printing apparatus, the apparatus including: a communication circuit configured to communicate with an external apparatus and receive print data and a cut command, a connector configured to be coupled to a first peripheral apparatus, a head configured to print the print data on recording paper, and a cutter configured to cut the recording paper based on the cut command, the method comprising: after no reception for a predetermined period of time since the

communication circuit has received information including a plurality of pieces of print data and a plurality of cut commands, transmitting a drive command to the first peripheral apparatus via the connector based on one cut command among the cut commands included in the reception information to drive the first peripheral apparatus, and not transmitting the drive command to the first peripheral apparatus based on another cut command.

8. The printing apparatus according to claim 1, wherein the at least one cut command is last in the plurality of cut commands.