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APPARATUS FOR ASSEMBLING PLASTIC CASES FOR CASSETTE TAPES

5 The present invention relates to an apparatus for producing and assembling plastic cases for cassette tapes, compact discs or similar articles. The present invention also relates to a method for producing and assembling such cases.

10 Plastic cases for cassettes, compact discs (CD) or the like are widely used. A plastic case generally comprises a male case member and a female case member pivotally jointed together to form an openable case for receiving a cassette or CD therein. Fig. 10 of the drawings shows the flow chart for producing and assembling a case and Fig. 11 shows the mechanical layout. First, two injection moulding machines 3a are utilized to respectively form the male case member 1a and the female case member 2a. Then, the two case members 1a and 2a are removed from the injection moulding machines 3a by being sucked by suckers on two robots 4a under the control of computer programs. After that, the two case members 1a and 2a are placed and positioned on an assembling machine 5a to complete the assembly of the case. After assembly, the case moves to a case stacking area to be subsequently packaged in boxes.

25 Fig. 12 shows the assembly of the male case member 1a and the female case member 2a. The male case member 1a has two nubs 11a for engaging two corresponding grooves 21a on the female case member 2a to form a pivotable case. For the assembling purpose, each groove has a longitudinal guiding path 22a extending therefrom for guiding the nubs 11a to enter the grooves 21a, facilitating assembly.

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However, the assembling machine 5a requires a complicated design in order to precisely assemble the male and female case members and to control the displacement of the holders, which leads to a high cost. Furthermore, two
5 injection moulding machines and two robots are required for respectively forming and assembling the male and female case member, which results in more required space and additional cost.

10 The present invention provides an apparatus for assembling plastic cases to mitigate and/or obviate the above-mentioned problems.

It is an object of the present invention to provide an
15 apparatus for assembling plastic cases for cassettes in which an improved assembling head is utilized.

It is another object of the present invention to provide an
20 apparatus for assembling plastic cases for cassettes in which small space is required.

It is still another object of the present invention to
provide an inexpensive apparatus for assembling plastic
cases for cassettes.

25 The invention comprises an apparatus for producing and assembling plastic cases consisting of a male case member and a female case member for cassette tapes or similar articles, the apparatus comprising;

30 an injection molding machine for simultaneously forming said male case member and said female case member;
and

a robot for removing said male and female case members
from said injection molding machine and assembling said
35 male and female case members, the robot having an assembly

head including an arm having a sucker assembly consisting of an upper sucker seat and a lower sucker seat, a plurality of suckers being provided on said upper and lower sucker seats, said suckers being controlled to selectively
5 retain the male and female case members on said sucker seats or release the case members for said sucker seats;

two parallel vertical holding arms being respectively provided adjacent to both sides of each said sucker seat; and

10 two vertical rails being formed on said arm between said upper sucker seat and said lower sucker seat, said upper sucker seat being movable along said vertical rails under the control of an actuating bar provided on said upper sucker seat, said lower sucker seat being articulated
15 to said arm at a lower portion thereof.

The invention further comprises a method for producing and assembling plastic cases consisting of a male case member and a female case member for cassette tapes or similar
20 articles comprising the steps of:

(a) simultaneously forming said male case member and said female case member by means of an injection molding machine;

25 (b) sucking and assembling said male case member and said female case member by a robot as defined in the paragraph above, and

(c) gathering and packaging the assembled plastic cases in a packaging means.

30 These and additional objects, if not set forth specifically herein, will be readily apparent to those skilled in the art from the detailed description provided hereunder, with appropriate reference to the accompanying drawings.

35 In the drawings:

Fig. 1 is a flow chart showing the forming and assembling of plastic cases by the apparatus according to the present invention;

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Fig. 2 is a schematic view showing the disposition of the apparatus for forming and assembling plastic cases according to the present invention;

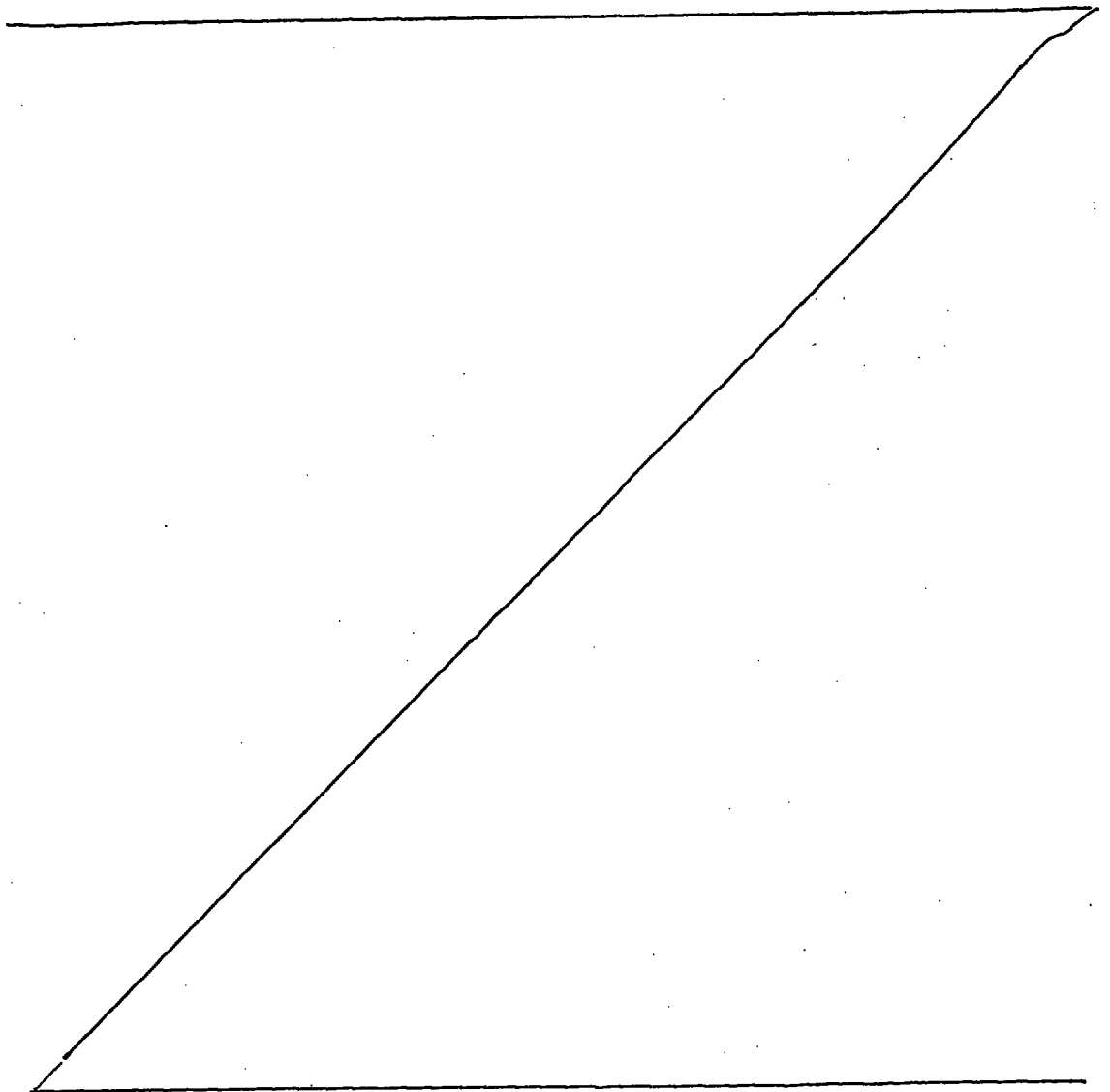


Fig. 3 is a perspective view of a robot according to the present invention;

Fig. 4 is a schematic perspective view showing the sucker assembly on the arm of the robot;

Fig. 5 is an exploded perspective view showing a plastic case made in apparatus according to the present invention;

Fig. 6 is a schematic side view showing the assembly of the male case member and the female case member of the case of Fig. 5, in which the two case members are in a pre-assembled condition;

Fig. 7 is a schematic side view similar to Fig. 6, in which the two case members are engaged;

Fig. 8 is a schematic side view similar to Fig. 6, in which the upper case member is released from the upper sucker seat of the arm of the robot;

Fig. 9 is a schematic side view similar to Fig. 6, in which the lower case member is released from the lower sucker seat of the arm of the robot;

Fig. 10 is a conventional flow chart for forming and assembling plastic cases for cassettes;

Fig. 11 is a schematic view showing the disposition of a conventional prior art apparatus for forming and assembling conventional plastic cases;

Fig. 12 is an exploded perspective view of a conventional prior art plastic case;

Fig. 13 is a schematic view showing a prior art injection mould.

Referring to Figs. 1, 2 and 5, according to the present invention, an injection moulding machine 2 is used to produce plastic cases in an injection mould 20 (not shown in Fig. 2, but is shown in Fig. 13) and a robot 1 is used to remove the plastic cases from the injection mould. The plastic case comprises a male case member 3 and a female case member 4 which are simultaneously formed in the injection mould 20. After formation, the male case member 3 and the female case member 4 are removed from the injection moulding machine 2 and assembled by the robot 1. Reference character 5 represents a packaging device for gathering and packaging assembled cases which is so conventional that no further description is required.

The method for producing and assembling plastic cases comprises the following steps (as shown in the flowchart of Fig. 1): (a) forming a male case member and a female case member in an injection mould by means of an injection moulding machine; (b) sucking the male case member and the female case member from the mould and assembling them together using a robot; and (c) packaging the assembled plastic cases in a packaging means.

Referring to Figs. 3 and 4, the robot 1 includes an arm 6 having a sucker assembly 11 consisting of an upper sucker seat 114 and a lower sucker seat 115. A plurality of suckers 111 are provided on the upper and lower sucker seats 114 and 115. The suckers 111 are controlled by a plurality of air cylinders (not shown) in the upper and lower sucker seats 114 and 115 in the arm 6, in order to selectively retain the male and female case members 3 and 4 on the sucker seats 114 and 115 (by means of suction), or

release the cases members 3 and 4 from the sucker seats 114 and 115.

As best shown in Fig. 4, on each sucker seat 114 and 115, there are two parallel vertical holding arms 8 respectively provided adjacent to both sides of the sucker seats 114 and 115, which will be described in detail later. On the arm 6 of the robot 1, there are two vertical rails 116 formed between the upper and the lower sucker seats 114 and 115. The upper sucker seat 114 is movable along the vertical rails 116 under the control of an actuating bar 113 provided on the top of the upper sucker seat 114. The lower sucker seat 115 is articulated to the arm 6 at 117. The robot 1 is controlled by computer programs such that linear displacement, angular displacement, rotation, and return stroke thereof may be precisely pre-set, in order to accomplish the suction and assembly of the case members.

Referring to Fig. 5, the male case member 3 has two oppositely disposed nubs 31, and the female case member 4 has two complimentary grooves 41 (only one of the grooves is shown). In addition, in order to match the operation of the assembly, each groove 41 has a guiding path 42 extending therefrom parallel to the moving direction of the movable upper case member during assembly.

Fig. 13 shows the formation of the male case member 3 and the female case member 4 in the injection mould 20 which includes a first mould part 26 and a second mould part 28. Conventionally, the injection moulding machine 2 injects material into the injection mould 20 to form the male case member 3 and the female case member 4. After formation, the first and second mould parts 26 and 28 are separated. As can be seen in this figure, four male case members 3 are formed on an upper portion of the first mould part 26, and

four female case members 4 are formed on a lower part of the first mould part 26. Each pair of male and female case members 3 and 4 are retained in the first mould part 26 and placed in a manner for subsequent assembly.

5 Thereafter, referring to Fig. 2 and Figs. 6 through 9, the robot 1 moves, under conventional control, to a position adjacent to the first mould part 26 to suck the male and female case members 3 and 4, such that the male case member 3 is sucked and retained by the upper sucker seat 114, and
10 the female case member 4 is sucked and retained by the lower sucker seat 115, as shown in Fig. 6 (the arrows in Figs. 6 through 9 represent the direction of force applied by the air cylinders in the arm 6). Then, the robot 1 carries the male and female case members 3 and 4 to an
15 assembling position. As soon as the male and female case members 3 and 4 are sucked and retained on the sucker seats 114 and 115, the holding arms 8 are actuated by pneumatic cylinders to engage with both sides of the male and female case members 3 and 4, to keep the male and female case
20 members 3 and 4 in mutual parallel relationship. Alternatively, the female case member 4 and the male case member 3 may be respectively sucked by the upper sucker seat 114 and the lower sucker seat 115.

25 Then, the actuating bar 113 is actuated to move the upper case member (in this circumstance is the male case member 3) downwards, such that the nubs 31 of the male case member 3 are guided by corresponding guiding paths 42 to engage with the corresponding grooves 41 of the lower case member,
30 i.e., the female case member 4, as shown in Fig. 7.

Referring to Fig. 8, after the engagement of the nubs 31 and the grooves 41, the holding arms 8 disengage with the upper case member 3, and the air cylinder on the upper
35 sucker seat 114 blows gas to cause the upper case member 3

to move pivotally, as shown by the arrow in Fig. 8, to form a partially closed case. The actuating bar 113 moves the upper sucker seat 114 upwardly to its original position for subsequent assembly.

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Referring to Fig. 9, a cylinder 7 in the arm 6 pushes the partially closed case such that the case is completely closed. Then, the assembled case is moved to the packaging box 5 by the robot 1. The robot 1 moves to the injection mould 20 to suck the next male and female case members 3 and 4, and carries them to the assembling position for subsequent assembly, and so on.

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C L A I M S:

1. An apparatus for producing and assembling plastic cases consisting of a male case member and a female case member for cassette tapes or similar articles, the apparatus comprising;

an injection molding machine for simultaneously forming said male case member and said female case member; and

a robot for removing said male and female case members from said injection molding machine and assembling said male and female case members, the robot having an assembly head including an arm having a sucker assembly consisting of an upper sucker seat and a lower sucker seat, a plurality of suckers being provided on said upper and lower sucker seats, said suckers being controlled to selectively retain the male and female case members on said sucker seats or release the case members for said sucker seats;

two parallel vertical holding arms being respectively provided adjacent to both sides of each said sucker seat; and

two vertical rails being formed on said arm between said upper sucker seat and said lower sucker seat, said upper sucker seat being movable along said vertical rails under the control of an actuating bar provided on said upper sucker seat, said lower sucker seat being articulated to said arm at a lower portion thereof.

2. An apparatus for producing and assembling plastic cases substantially as hereinbefore described with reference to and as shown in Figures 1 to 9 of the accompanying drawings.

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3. A method for producing and assembling plastic cases consisting of a male case member and a female case member for cassette tapes or similar articles comprising the steps of:

5 (a) simultaneously forming said male case member and said female case member by means of an injection molding machine;

10 (b) sucking and assembling said male case member and said female case member by a robot as defined in claim 1, and

(c) gathering and packaging the assembled plastic cases in a packaging means.