United States Patent [19]

Hatta

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[54] **PACKING AND ALIGNING DEVICES FOR PIECES OF CANDY**

[75] Inventor: **Akihiro Hatta,** Sakai, Japan

[73] Assignee: **Tenchi Kikai Kabushiki Kaisha,** Sakai, Japan

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[52] **U.S. Cl.** **53/234**

[51] **Int. Cl.** **B65b 11/30**

[58] **Field of Search** 53/209, 225, 232, 233, 53/234

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Primary Examiner—Travis S. McGehee
Assistant Examiner—John Sipos
Attorney, Agent, or Firm—Holman & Stern

[57] **ABSTRACT**

The packing and aligning device for pieces of candy comprising a receiving and feeding mechanism for bringing pieces of candy of square columnar hexahedron into alignment longitudinally thereof along the circumference of the mechanism by horizontal rotation of the mechanism and feeding pieces of candy to a feed channel extending tangentially of the mechanism; a takeout turret adapted to clamp the pieces of candy one by one together with packing paper and, while transferring the same along a first transfer path, to bend the packing paper; a relay transfer turret adapted to receive the pieces of candy from the takeout turret and change the direction of the clamped pieces of candy and transfer path, and while transferring the same, to fold the surplus ends of the packing paper to thereby finish packing; and an aligning and tranfer mechanism adapted to group by a specified quantity the packed pieces of candy received from the relay turret and align and transfer the same.

8 Claims, 15 Drawing Figures

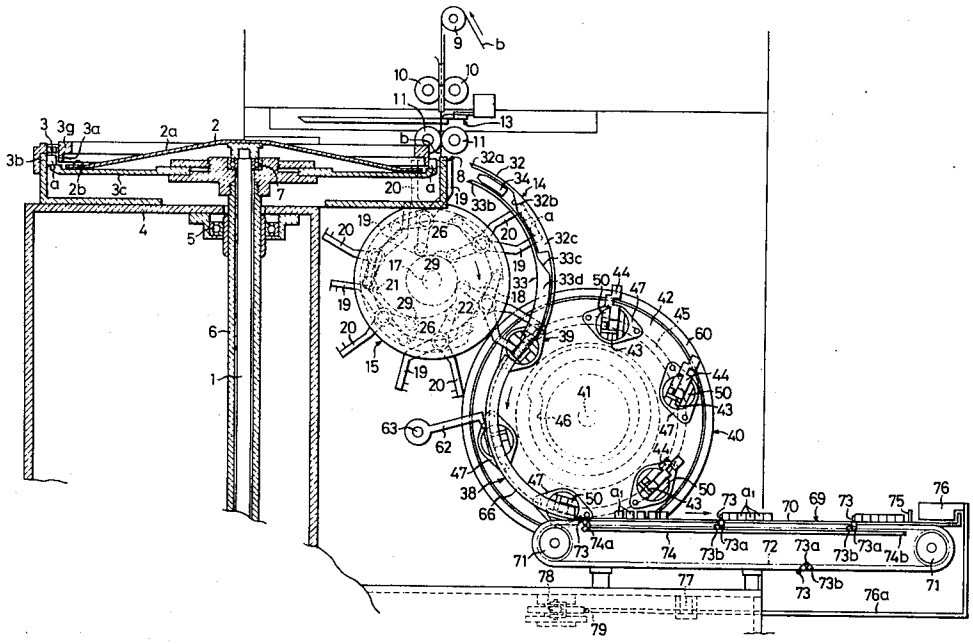
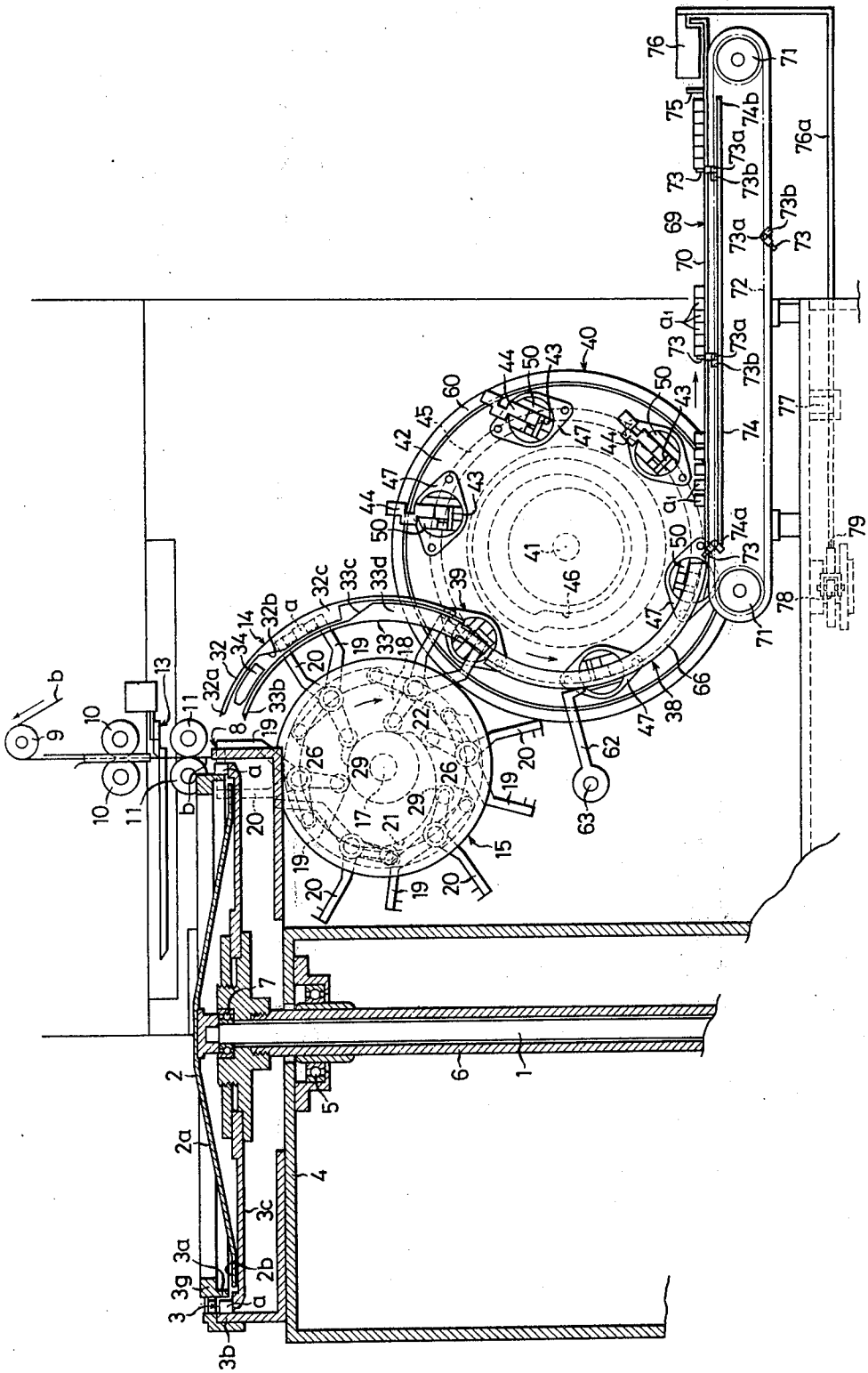


Fig. 1



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SHEET 2

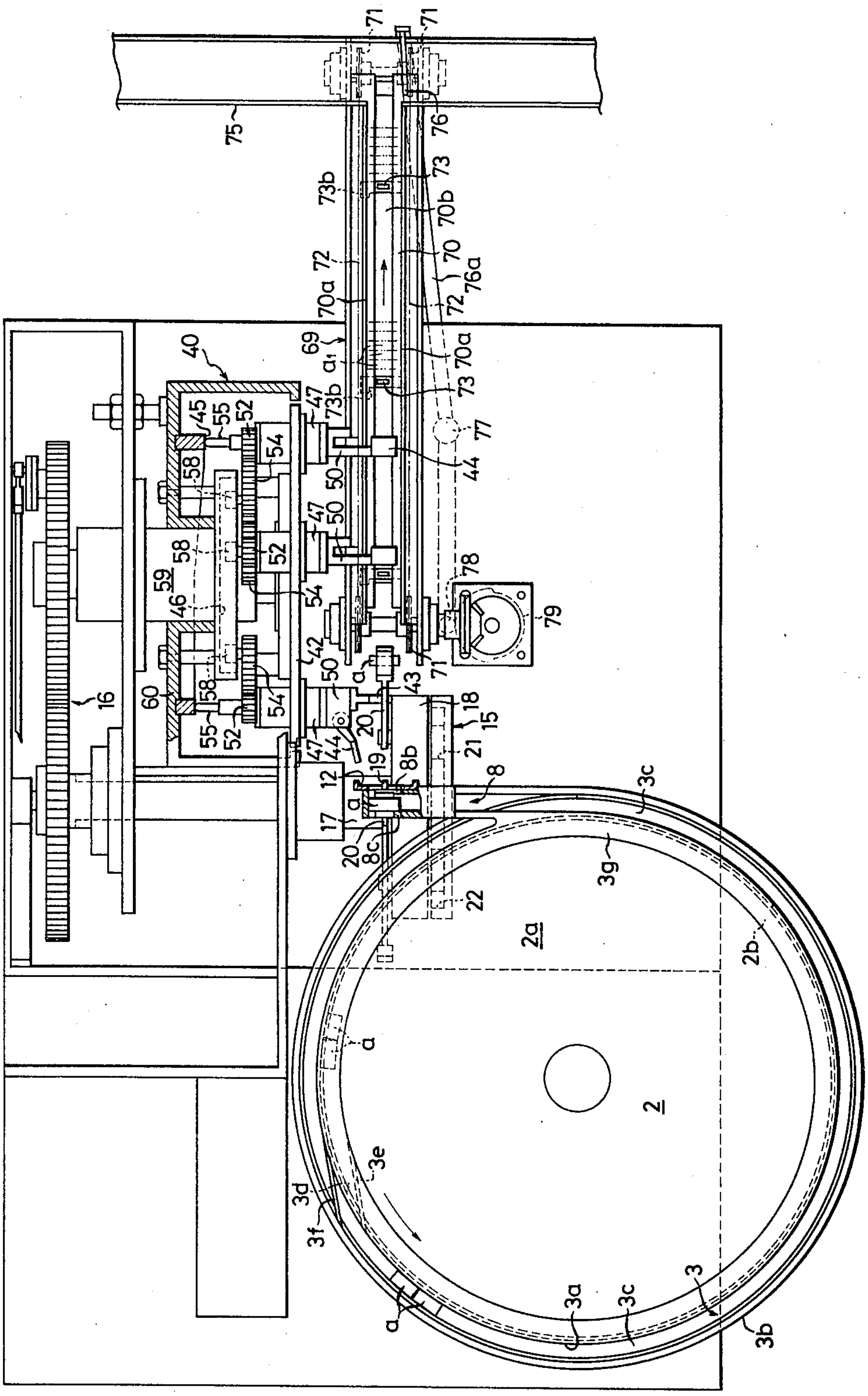


Fig.2

Fig.3

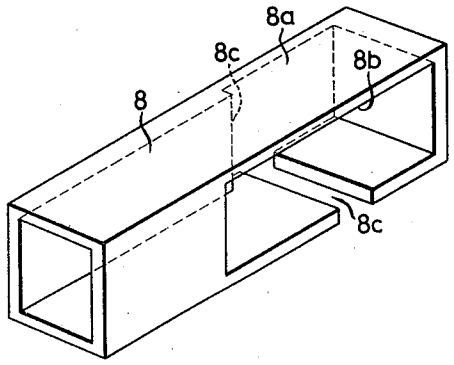


Fig.4

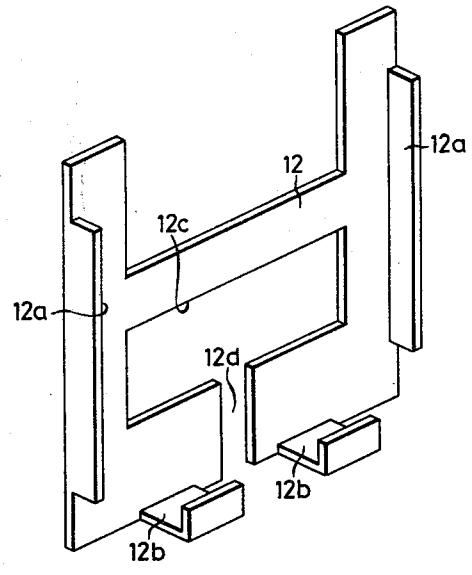
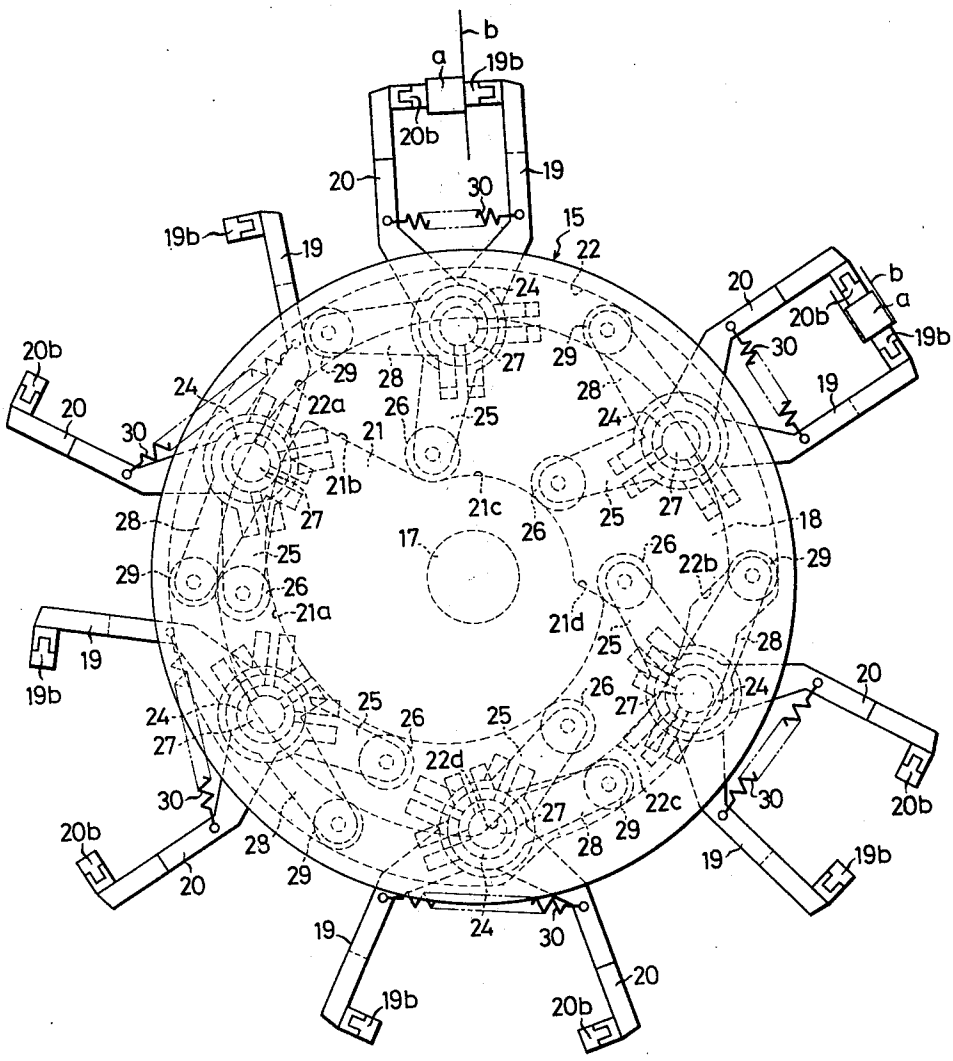


Fig.5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19b
20b
20
19
30
15
22
24
27
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18
22b
21d
21a
22d
22c
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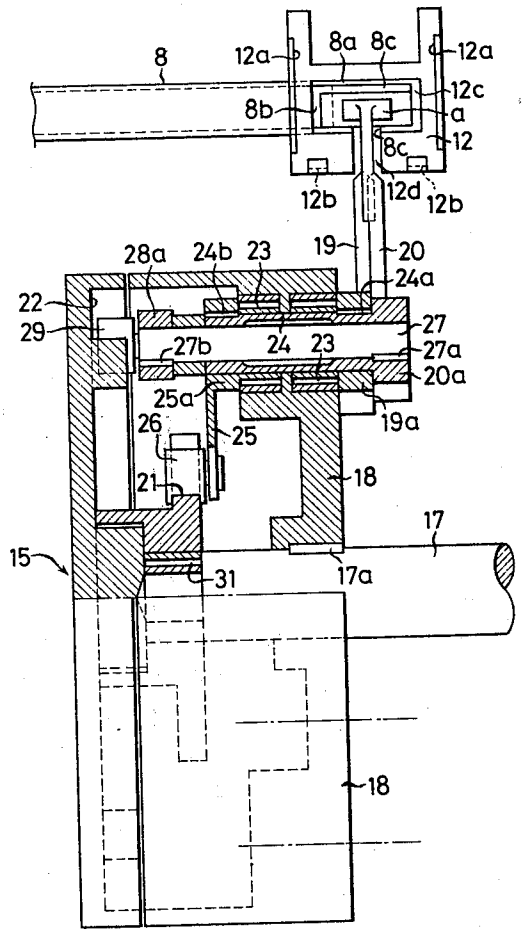
Fig.6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12b
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24a
22
29
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18
17
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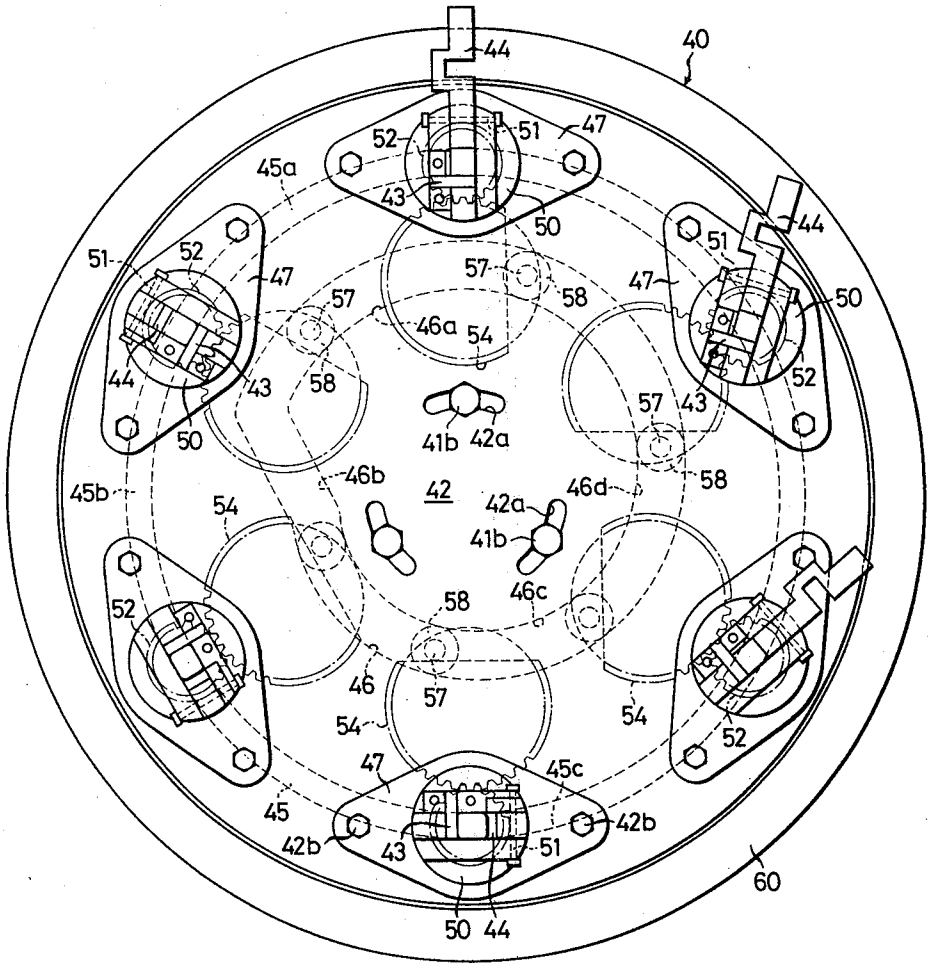
31
17a
18

Fig.7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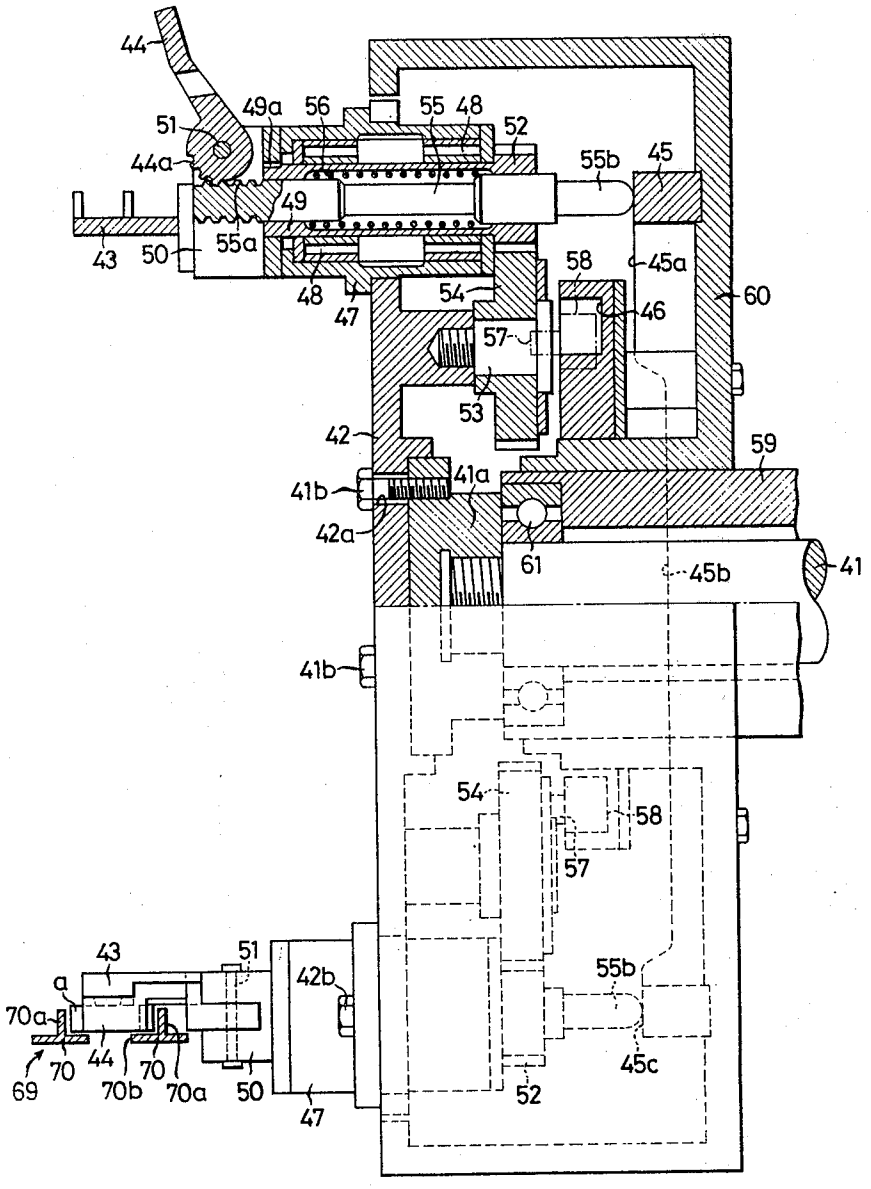
45c
42b
60

Fig.8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41b
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42a
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54
58
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70a
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70
69
70b
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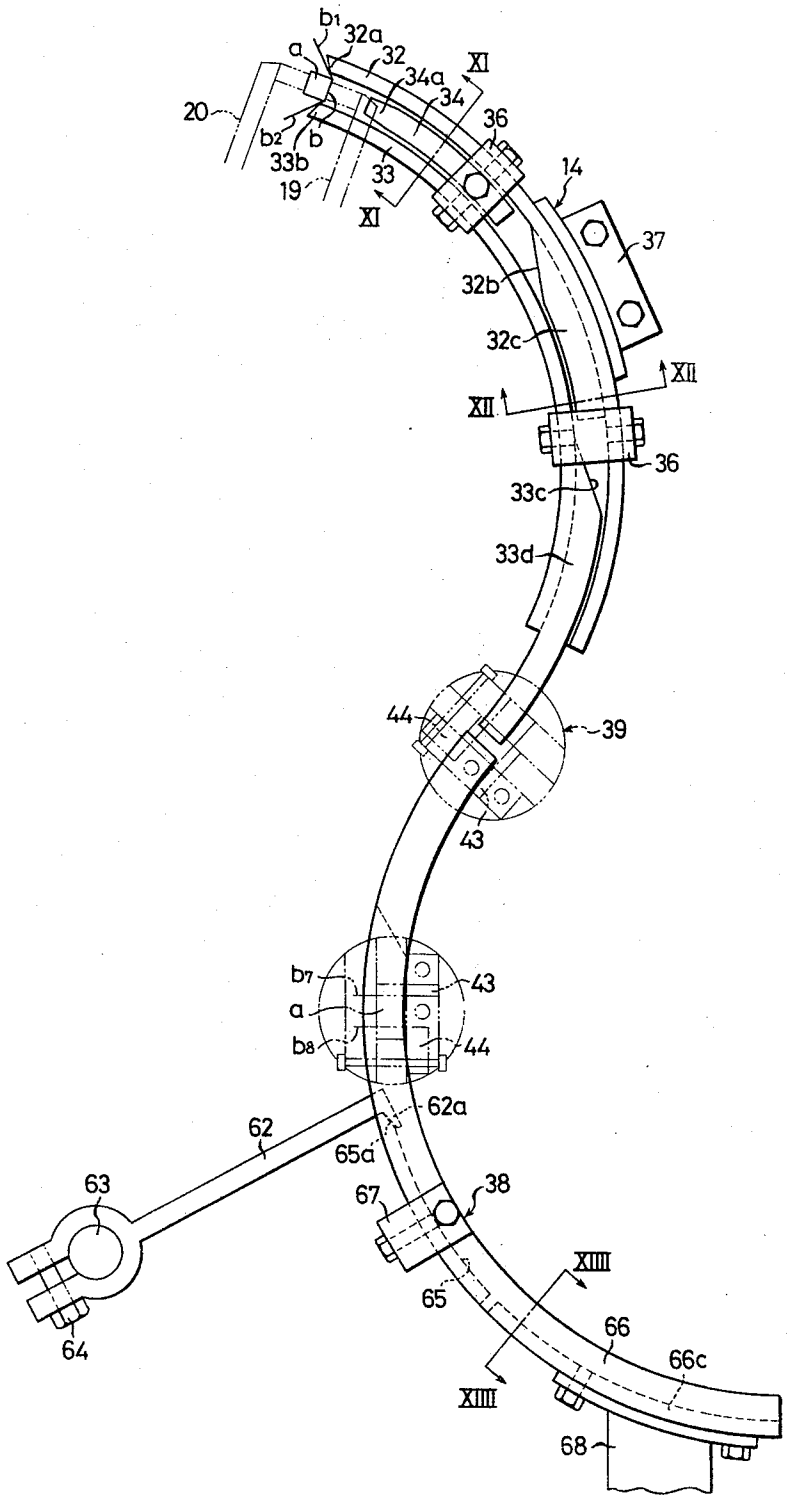
50
47
52
45c

Fig.9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32
34a
34
XI
20
36
b2
b
33b
19
33
14
XI
37
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32c
XII
XII
36
33c
33d
44
39
43
b7
a
b8
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44
62a
62
65a
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67
38
XIII
65
66
66c
64
XIII
68

Fig. 10

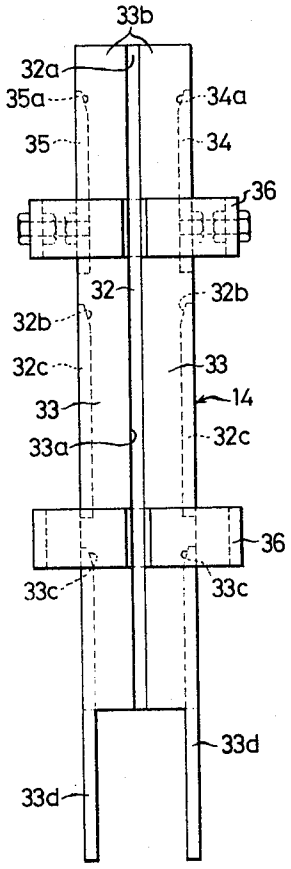


Fig. 11

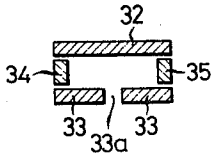


Fig. 12

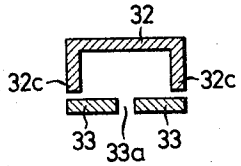


Fig. 13

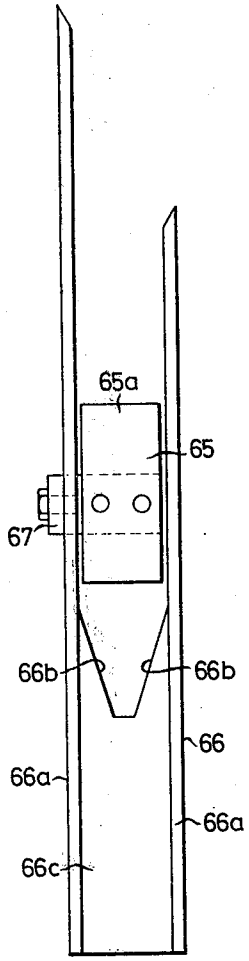


Fig. 14

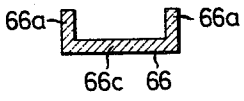
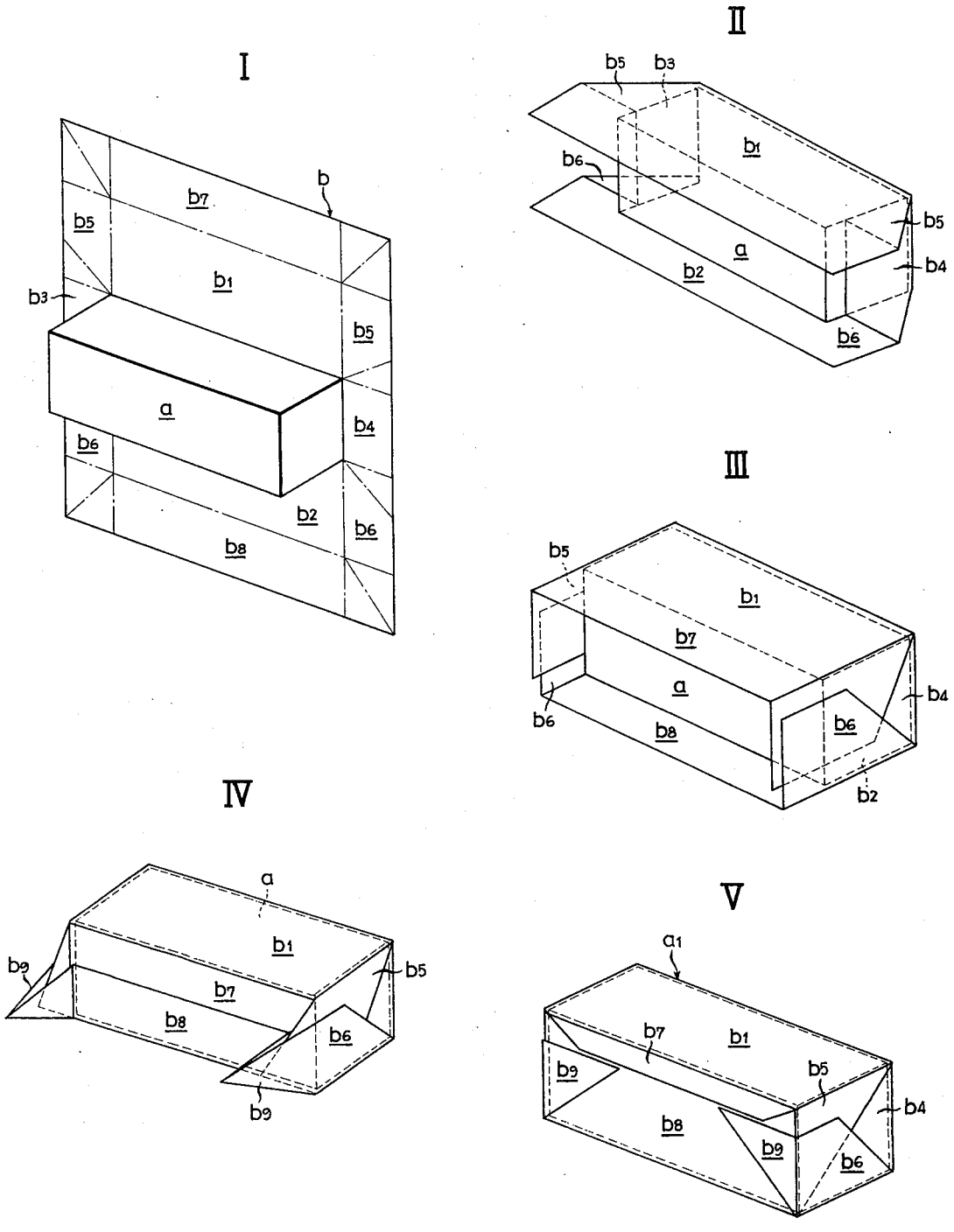


Fig. 15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b7
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b4
b6
b6
b8
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IV
a
b1
b9
b5
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b8
b6
b9
V
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b1
b9
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b4
b8
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b6

PACKING AND ALIGNING DEVICES FOR PIECES OF CANDY

BACKGROUND OF THE INVENTION

This invention relates to a packing and aligning device for various kinds of candy of square columnar hexahedron such as caramels, etc., and more particularly to a device both for independently packing each piece of candy and for grouping and aligning a specified quantity of pieces of candy thus packed for a later step of process of filling a box with the specified quantity of candy.

Generally, a packing machine for packing such pieces of candy apiece is known, but operation for grouping and packaging the specified quantity of the packed candy in a box is mostly made by hand. And it often happens that packed pieces of cand break up apiece during grouping and packaging of the packed pieces of candy in a box, which fact makes the operation of packaging the candy in a box appreciably cumbersome, thus reducing operation efficiency. Furthermore, the packing operation by hand had the disadvantage that not only it requires the increased number of workers for the operation but also it is not recommendable from the hygienic point of view.

SUMMARY OF THE INVENTION

A primary object of this invention is to provide a packing and aligning device capable of packing pieces of candy apiece, grouping and aligning a specified quantity of the thus packed candy entirely automatically and speedily by a conveyor system.

Another object of this invention is to completely prevent breaking up of the packed pieces of candy during the subsequent grouping operation and to facilitate the operation for packaging the grouped pieces of candy in a box.

This invention comprises a rotary disk, said disk being designed to receive a number of pieces of candy of square columnar hexahedron on the surface of the horizontally rotating disk and to move the pieces of candy in centrifugal and rotating directions; a guide channel, said channel being arranged on the circumference of said disk and adapted to receive the candy on the disk longitudinally thereinto and to feed the same continuously to a feed channel, said feed channel which is formed in the side of the terminal thereof with an opening for taking out the candy and with a receiving space fronting said opening, said space being designed for receiving packing paper cut into a specified size, said terminal portion being further formed both on the underside and in the side opposite to said opening with a crossing path permitting the passage of the clamp portions of first clamping members transversing the channel while the members are clamping the candy that reached said terminal portion, said feed channel extending tangentially of said disk in succession to said guide channel and receiving longitudinally aligned pieces of candy from the guide channel and feeding the same to said terminal, packing paper feed device for unrolling a long roll of packing paper, feeding the same to the packing paper receiving space of said feed channel and cutting said cutting paper in specified lengths; a takeout turret, said turret having plural pairs of said first clamping members pivotally supported at equal spaces on the side circumference of a first turret base rotating at constant speed in the direction in which the

members cross said feed channel, said turret having further a pair of first cam mechanisms that open and close each of said pairs of first clamping members by rotation of said base in the direction of rotation of the base, said turret operating that clamping member which advances ahead of the other clamping member in the direction of rotation of one of said cams while the clamping members are crossing the terminal portion of said feed channel, clamping the piece of candy positioned in the terminal portion of said feed channel together with the packing paper fed in front of said direction of rotation between the clamp portions of the clamping members and taking out said piece of candy from the feed channel and releasing the piece of candy together with said packing paper from said clamping by operating said clamping members by said pair of cams by the clamping members being rotated to a specified position; a first packing paper folding members for successively bending the surplus ends of packing paper over, and bringing the same into contact with, the four sides adjacent to the front side of the piece of candy facing the inner and outer circumferences and both sides of a first transfer path, said packing paper being brought into contact with the front side of the pieces of candy successively arranged along the inner and outer circumferences and both sides of the first transfer path and transferred along the path along which said turret clamps the piece of candy and transfers the same; a relay transfer turret, said transfer turret having plural pairs of second clamping members mounted at equal spaces on the side circumference of a second turret base rotating synchronously with said first turret base, said transfer turret having further a pair of second cam mechanisms that open and close said second clamping members by rotation of the second turret base and also impart reciprocating rotation of specified angle to said pairs of second clamping members, said turret facing the clamp portions of the second clamping members toward a second transfer path in succession to the first transfer path and rotating the same, said turret further causing the second clamping members to effect closing operation in a radial direction from the inner and outer circumferential sides of the first and second transfer paths at the point of connection of the first and second transfer paths at which said first clamping members release their clamping of that piece of candy, over the front side and four circumferential sides of which packing paper is folded and with which the paper is brought into contact, said turret furthermore causing the second clamping members to clamp the piece of candy by the outside of the packing paper, to make delivery operation of passing the piece of candy from the first clamping members to the second clamping members, to change the direction of the piece of candy by transferring the candy to the second transfer path and by imparting forward rotation of specified angle to the second clamping members, and to finally release the piece of candy from the clamp portions of the second clamping members at the terminal of the second transfer path by imparting opening action to the second clamping members; a swing member disposed on the outer circumference of the second transfer path and which swings in the direction of transfer of the second path and which folds a surplus end of packing paper toward the front side of the piece of candy, said end projecting behind the direction in which the piece of candy turned about by the aforestated forward rotation advances; a

second folding member, said folding member being disposed on the outer circumference of said second transfer path and being adapted to fold the other surplus end of the packing paper backwardly after said swing member finished folding and to fold the folded surplus ends jutting out on both folded sides of the packing paper of the piece of candy to thereby bring the folded surplus ends into contact with the piece of candy; and an aligning and transfer mechanism having a guide portion for receiving thereinto in a laterally aligned state the packed pieces of candy released from said relay transfer turret and having also a means to push and feed the pieces of candy onto the guide portion after grouping the same by specified quantity.

Thus, the invention makes it possible not only to carry out packing, grouping and aligning of pieces of candy for loading the same into a box on an entirely automatic basis but also to completely prevent the packed pieces of candy from breaking up loose while they are being grouped by specified quantities. And the packed pieces of candy grouped in specified quantities are aligned laterally and transferred to the next packing station.

Other objects and features of the invention will become more apparent from a description of an embodiment of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a front view, partly in longitudinal section, of an embodiment of this invention;

FIG. **2** is a plan view, partly omitted, of FIG. **1**;

FIG. **3** is a perspective view showing the detail of the terminal portion of a feed channel;

FIG. **4** is a perspective view of a packing paper receiving member mounted at the terminal portion;

FIG. **5** is a front view showing the detail of a takeout turret;

FIG. **6** is a longitudinal sectional side view showing a part of the turret;

FIG. **7** is a front view showing the detail of a relay transfer turret;

FIG. **8** is a longitudinal sectional side view showing a part of the transfer turret;

FIG. **9** is a front view showing the detail of a first and a second transfer path portion;

FIG. **10** is a side view of the first transfer path portion;

FIGS. **11** and **12** are cross-sectional views taken along lines XI—XI and XII—XII, respectively of FIG. **9**;

FIG. **13** is a side view of the second transfer path portion;

FIG. **14** is a cross-sectional view taken along line XIX—XIV of FIG. **9**; and

FIG. **15** is a perspective view showing the sequence of packing of pieces of candy according to the characters I to V.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIGS. **1** and **2**, pieces of candy a are placed collectively in large numbers on the surface of a rotary disk **2** mounted on the upper end of a vertical shaft **1** and rotating horizontally and having a gently conically inclined plane **2***a*. The pieces of candy *a* placed on the disk **2** are moved in the direction of rotation of the disk **2** while being moved both by gravity and by the centrifugal force imparted by rotation of the disk toward the circumference **2***b* of the disk **2** along the inclined plane **2***a*.

On the outer circumference of the disk **2** is formed a circular guide channel **3** made up of circumferential walls **3***a* and **3***b* and a rotary bottom plate **3***c*, and on the inner circumferential wall **3***a* are formed an opening **3***d* and guide pieces **3***e* and **3***f* for introducing into the guide channel **3** the candy *a* on the disk **2** which is being moved in the direction of rotation of the disk **2** on the inner circumference of the wall **3***a*.

The rotary bottom plate **3** *c* is mounted on the top end of a cylinder shaft **6** supported through a bearing **5** on a machine frame **4** and is driven independently of the disk **2** in the same direction as the disk **2** and is designed to support the pieces of candy a introduced from on the disk **2** into the guide channel **3** in their longitudinal alignment along the circumferential walls **3***a* and **3***b*. The vertical shaft **1** is rotatably supported inside the cylinder shaft **6** through a bearing **7.** The shaft **1** and the shaft **6** are provided on the lower portions (not shown) with torque transmitting means such as gears driven by a drive system. The inner circumferential wall **3***a* of the guide channel **3** is provided on the upper end with a flange-shaped portion **3***g* jutting out on the inside diameter of the channel **3,** and the flange-shaped portion **3***g* is formed above the circumferential portion **2***b* of the rotary disk **2** and is useful for preventing another piece of candy *a* from being placed on the piece of candy *a* that is being transferred along the circumferential wall **3***a*.

As shown in FIG. **2,** on the outer circumference of the rotary disk **2** is formed a feed channel **8** extending tangentially in succession to the guide channel **3** and the pieces of candy *a* which are transferred by the bottom plate **3***c* through the guide channel **3** are fed from the guide channel **3** into the feed channel **8.**

The feed channel **8,** as shown particularly in FIGS. **3** and **6,** is provided in the side to the right of the feed terminal **8***a* in FIG. **2** with an opening **8***b* for taking out the candy *a* that reached the terminal **8***a* and is further provided on the bottom plate of the channel **8** and on the side opposite to the opening **8***b* with a path **8***c* that permits the passage of the clamp portions of first clamping members therethrough which transverse the channel **8** at the terminal **8***a* and which members will later be described, and the pieces of candy *a* which are fed from the guide channel into the path **8***c* in their longitudinal alignment are pushed through the supply path **8** by the succeeding pieces of candy *a* and reach the terminal portion **8***a*.

On the other hand, packing paper *b* that individually packages pieces of candy *a* is used in the form of a long sized strip wound on a reel supported on a portion (not shown) in FIG. **1,** and is unrolled by a pair of delivery rolls **10** through a guide roll **9** and is further fed by a pair of delivery rolls **11** into a packing paper receiving portion **12** fixed to the outside of the opening **8***b* of the feed channel **8.** While the paper is being fed, it is cut into a specified size by a cutter **13** disposed between the rolls **10** and the rolls **11.**

The cutter **13** is related with a drive mechanism (not shown) so as to be actuated synchronously with a transfer speed of candy *a* in the transfer course to be later

described and the rolls **10** and **11** are also specified in their delivery speed.

As shown particularly in FIGS. **4** and **6**, the packing paper receiving portion **12** is provided on both side edges and on the lower edge with a guide edge **12***a* and a bearing portion **12***b* which guide and receive the packing paper fed out from delivery rolls and cut into a required size and is further provided with an opening **12***c* and a slit **12***d*, said opening **12***c* permitting the passage of the candy *a* taken out from thhe channel **8** and said slit **12***d* permitting the passage of the clamping members therethrough. The packing paper receiving portion **12** is fixed to the outside surface of the opening **8***b* of the feed channel **8.** Namely, the packing paper *b* cut into a specified size is positioned in front of the direction of transfer of candy *a* by the paper *b* being received into the receiving portion **12,** said direction of transfer being later described.

A takeout turret **15** which clamps the candy *a*, that reached the terminal end **8***a* of the feed channel **8,** together with the packing paper *b* that was caused to front the candy *a* in the direction of transfer of candy *a*, and which transfers the same through a first transfer path **14,** as shown in FIGS. **1** and **2** and more particularly in FIGS. **5** and **6,** includes a first turret base **18** mounted through a key **17***a* and rotated by a shaft **17,** said shaft being rotated at constant speed by the drive mechanism **16** within the device of the invention, plural pairs of first clamping members **19** and **20** pivotally supported at equal spaces in the circumferential side of the turret base **18,** and first cam mechanisms **21** and **22** operating said members **19** and **20** by rotation of the turret base **18.**

One member **19** of the first clamping members **19** and **20** has its base portion **19***a* fixed through a key **24***a* to the end of a cylinder shaft **24** rotatably supported on the turret base **19** through a bearing **23,** and the cylinder shaft **24** has the base **25***a* of a roller arm **25** fixed to the other end of the shaft **24** through a key **24***b* and rolls a roller **26** mounted pivotally to the end of the roller arm **25** into contact with the circumference of one cam **21** of the first cam mechanism **21** and **22** and is designed to cause the member **19** to swing and rotate arcuately around the shaft **24** under the control of the cam **21** by rotation of the turret base **18.**

The other member **20** of the clamping members is fixed through a key **27***a* to one end of a shaft **27** inserted through the inner hole of the cylinder shaft **24** and rotatably supported, said shaft **27** having a base **28***a* of the other roller arm **28** fixed through a key **27***b* to the other end of the shaft **27** to bring a roller **29** pivotally supported on the end of the roller arm **28** into engagement in the grooved cam **22** of the cam mechanisms **21** and **22** to thereby cause the member **20** to be swung and rotated arcuately under the control of the grooved cam **22** by rotation of the turret base **18.** There is provided an extension spring **30,** as shown, between the members **19** and **20,** said spring **30** assuring rolling of the roller **26** into contact with the circumferential surface of the cam **21.** The cam mechanisms **21** and **22** are fixedly supported on the frame **4** of the invention, though not shown, and support the end of the rotating shaft **17** of the turret base **18** through a bearing **31.**

In this manner, the first clamping members **19** and **20** can open and close their clamping pawls **19***b* and **20***b* with respect to each other by the clockwise rotation of the turret base **18** (FIG. **1**) while the opening and closing are being controlled by the cam mechanisms **21** and **22** in conjunction with the rotation of the base **18.**

The opening and closing operation described above is carried out in such a manner that, in the clockwise rotation of the turret base **18,** one member **19** of the first clamping members **19** and **20** is designed to be moved to a prostrated position so as to permit the passage of its clamp pawl **19***b* below the feed channel **8** by the roller **26** of the member **19** riding on a high portion **21***a* of the cam **21** before the pawl **19***b* reaches the position in which it crosses the feed channel **8** and that, when the pawl **19***b* passed the underside of the feed channel **8,** the roller **26** pressed by the spring **30** into rollable contact with the circumference of the cam passes over the inclined plane **21***b* of the cam **21** and is rolled into contact with the low portion **21***c* in the position in which the cylinder shaft **24** reached substantially immediately below the feed channel **8** and then the member **19** which was in its prostrated position up to that time is moved into its upright position as shown.

The other member **20,** the roller **26** of which is already in the high portion **22***a* of the grooved cam **22,** is advancing clockwise in its upright position and faces its clamp pawl **20***b* toward the crossing path **8***c* of the feed channel **8** in the position in which the shaft **27** reached substantially immediately below the feed channel **8** and comes in contact with the rear side surface of the candy *a* in the transfer direction of the candy.

Accordingly, the pawl **19***b* which was once projected forwardly of the direction of transfer of candy *a* is reversed in direction and reinstated in a counterclockwise direction by shift of the member **19** into its upright position, and the packing paper *b* on the front side of the candy *a* is brought into contact with the candy *a* so as to clamp the candy *a* and the paper *b* between the pawls **20***b* and **19***b* of the members **20** and **19** in the state of the candy a and packing paper *b* being kept in contact with each other. The clamping power in this case is given by the spring **30.**

The candy *a* and packing paper *b* thus clamped between the first clamping members **19** and **20** are transferred along the first transfer path **14** by the members **19** and **20** while the packing paper *b* is being folded by the first folding member that will later be described.

When the candy *a* with its four sides brought into contact with the packing paper *b* folded is transferred to the terminal position of the first transfer path **14,** one member **19** of the first clamping members **19** and **20,** because the roller **26** of the member **19** rides onto the high portion **21***a* from a stepped portion **21***d* of the cam **21,** is rotated clockwise around the cylinder shaft **24** against the action of the spring **30,** while the other member **20,** because its roller **29** falls into the low portion **22***c* after passing the stepped portion **22***d* of grooved cam **22,** is rotated counterclockwise around the shaft **27.** Accordingly, the clamp pawls **19***b* and **20** are separated from each other and release the clamped candy *a*.

In the first clamping members **19** and **20** that unclamped the candy *a*, one member **19** is caused to gradually change its position to prostration by the roller **26** of the member **19** being transferred along the circumference of the high portion **21***a* of the cam **21** by further clockwise rotation of the first turret base **18,** and the other member **20** is brought back to its upright position by the roller **29** of the member being transferred to the high portion **22***a* of the cam **22** through the

stepped portion 22*d* of the grooved cam **22.** Namely, plural pairs of first clamping members **19** and **20** bring pieces of candy *a* and packing paper *b* into contact with each other and clamp them in the terminal portion 8a, said pieces of candy *a* and packing paper being successively fed to the terminal portion **8***a* of the feed channel **8** by rotation of the base **18,** transfer the same along the first transfer path **14** and unclamp the same in the terminal portion of the path **14.**

Both on the inner and outer circumferences and on both sides of the first transfer path **14** are disposed first folding members **32, 33** and **34, 35** which form the transfer path **14** and which fold the packing paper *b* brought into contact with the front side of the candy *a* over, and bring the same into contact with, the four sides of the candy *a* facing the inner and outer circumferences and both sides of the path **14** while the candy *a* is being transferred along the path **14.**

The members **32** and **33** are disposed on the inner and outer circumferences of the path **14,** while the members **34** and **35** are disposed on both sides of the path **14.** The members **32, 33** and **34, 35** are fixed by holders **36** and supported and fixed by brackets **37** to the frame **4** of the device so that the candy *a* clamped together with the packing paper *b* by the first clamping members **19** and **20** may be transferred between the members **32, 33** and **34, 35.**

The members **32,** as shown particularly in FIGS. **9** through **12,** is arcuately curved to thereby form an outer circumferential wall of the path **14,** projects its end **32***a* at the entrance to the path **14,** said end **32***a* being adapted to fold a surplus end b_1 of the packing paper b (FIG. **15**) clamped into contact with the candy *a* and to bring the end b_1 into contact with that surface of the candy *a* on the outer circumferential side, and has side wall portions **32**c in about the middle of the path **14,** said side wall portions **32***c* being bent so as to form both side walls of the member **32** and being formed with an inclined edge **32***b* adapted to form a surplus end b_5 of the packing paper *b* which is being transferred.

The member **33,** as shown likewise particularly in each of the above figures, is curved arcuately to thereby form the inner circumferential wall of said path **14** and is longitudinally formed with a slit **33**a permitting the passage of the arm portions of the first clamping members **19** and **20** therethrough, projects its end **33***b* at the entrance to the path **14,** said end **33***b* being adapted to fold a surplus end b_2 of the packing paper *b* clamped into contact with the candy *a* and to bring the end b_2 into contact with that surface of the candy *a* on the inner circumferential side and has side wall portions **33***d* in the terminal portion sides of the path **14,** said side wall portions **33***d* being bent so as to form both side walls of the member **33** and being formed with an inclined edge **33***c* adapted to fold a surplus end b_6 of the packing paper being transferred.

The members **34** and **35** are disposed so as to form side walls of the path **14** deep in the interior of the entrance to the path **14** and to function in such a manner that the members face their front ends **34***a* and **35***a* toward the entrance side, fold surplus ends b_3 and b_4 of the packing paper *b* which is being transferred and bring the ends into contact with both sides of the candy *a*.

In this manner, the packing paper which is brought into contact with, and caused to clamp, the candy *a* as shown in FIG. **15-I** by the first clamping members **19** and **20** in the terminal portion **8***a* of the feed channel **8** and which is transferred together with the candy *a* is folded at the surplus ends b_1 and b_2, as shown in FIGS. **9** and **15-II,** by the ends **32***a* and **33***b* of members **32** and **33** at the entrance to the first transfer path **14** to thereby bring the ends **32***a* and **33***b* into contact with each side of the candy *a* facing the outer and inner circumferential sides of the path **14** and is thereafter folded at the ends b_3 and b_4 as shown in FIG. **15-II** by the ends **34***a* and **35***b* of the members **34** and **35** to thereby bring the ends b_3 and b_4 into contact with each side of the candy *a* facing both sides of the path **14.**

Furthermore, in approximately the middle of the path **14,** the surplus end b_5 produced by the above folding and shown in FIG. **15-II** is folded as shown in FIG. **15-11** by the inclined edge **32***b* of the member **32,** and then a similarly folded end b_6 is folded as shown in FIG. **15-III** by the inclined edge **33***c* of the member **33** and is transferred to the terminal of the path **14** and released from clamping by the first clamping members **19** and **20.**

The candy *a* which was clamped into contact with a takeout turret **15** and transferred along the first path **14** and over which the packing paper *b* was folded as described during its transfer reaches the terminal of the path **14,** namely, a point of connection between the transfer path **14** and a second transfer path **38** formed in succession thereto, whereat the candy *a* is released from clamping by the turret **15** and is simultaneously therewith clamped by a relay transfer turret **40** rotated synchronously with the turret **15** and is transferred along the second transfer path **38.**

The relay transfer turret **40,** as shown in FIGS. **1** and **2** and more particularly in FIGS. **7** and **8,** is fixed through bolts **41***b* to the end face of a cap nut **41**a threadedly fixed to a shaft **41** driven by a drive mechanism **16** in the device, and includes a second turret base **42** counterclockwise rotated in synchronism with the first turret base **18,** plural pairs of second clamping members **43** and **44** pivotally supported at equal spaces on the circumference of the side of the base **42,** and second cam mechanisms **45** and **46** for closing and opening and reciprocally moving the members **43** and **44** by rotation of the base **42.** Bolts receiving holes **42***a* for permitting the insertion of bolts **41***b* therethrough for securing the second turret base **42** to said nut **41***a* are provided in the form of slots formed circumferentially as shown. Each of the slots **42***a* is useful for adjusting that position in which the second clamping members **43** and **44** synchronize with the first clamping members **19** and **20.**

Cylinders **47** are fixed by bolts **42***b* to the base **42** at equal spaces on the circumference of the base **42.** A cylinder shaft **49** rotatably supported through a bearing **48** on each of the cylinders **47** is inserted through each of the cylinders **47** and a bracket **50** is mounted through a key **41**a at the end of the cylinder shaft **49.**

And one member **43** of the clamping members **43** and **44** is fixed to the bracket **50** and projects, while the other member **44** is pivotally mounted by a shaft **51** to the bracket **50** so as to open and close with respect to the member **43.**

A gear **52** is fixed to the other end of the cylinder shaft, said gear **52** being brought into engagement with a gear **54** pivotally attached through a shaft **53** to the back of the aforestated base **42.**

Furthermore, a sliding rod **55** is slidably and axially inserted also through the cylinder shaft **49**, and a rack **55***a* formed at the end of each rod **55** is brought into engagement with a sector gear portion **44***a* formed on the base of the movable side member **44** of the clamping members **43** and **44**. And the rod **55** is urged by a spring **56** in the direction of the member **43** in which the member **44** is closed, and the end **55***b* of the rod **55** is brought into slidable contact with a face cam **45** of the second cam mechanisms.

On the other hand, a roller **58** is pivotally mounted on the shaft **57** protrudently provided in the eccentric position of the gear **54** and is fitted into a grooved cam **46** of the second cam mechanisms.

The cams **45** and **46** are fixedly provided on a housing fixed through a holder **59** to the frame **4**, and accordingly the second clamping members **43** and **44** are controlled by the cams **45** and **46** in accordance with rotation of the second turret base **42** and make reciprocating movement together with the cylinder shaft **49** at a certain angle of rotation (90° in the embodiment shown), and the closing and opening of the member **46** by sliding of the slidng rod **55** is carried out. The numeral **60** designates a bearing that pivotally supports the end of a shaft **41** on the holder **59**. Namely, the second clamping members **43** and **44** supported by the bracket **50** of the cylinder shaft **49** are rotated counterclockwise around the shaft **41** of the base **42** by the counterclockwise rotation of the second turret base **42**, and when they reached the aforestated point of connection **39**, they face their clamp portions toward a second transfer path **38** and advance along the path **38**. On the other hand, a sliding rod **55** whose sliding is controlled by the face cam **45** in accordance with the above counterclockwise rotation slides on a high portion **45***a* of the face cam **45** until the member **44** reaches the point of connection **39**, and is caused to project to the left in FIG. **8** and keeps the member **44** released with respect to the member **43**, but as soon as the second clamping members **43** and **44** reach the point of connection **39**, the rod **55** drops into the low portion **45***b* of the face cam **45** by the action of the spring **56**. Accordingly, the member **44** that brings a sector gear portion **44***a* into engagement with the rack **55***b* moved toward the member **43** and closes the clamp portions.

The attitude of rotation of the cylinder shaft **49** is controlled by the grooved cam **46** through the gear **54** with which a gear **52** of the shaft **49** meshes and through a roller **58** on the gear **54**. Namely, the attitude of the cylinder shaft **49** is so designed that the roller **58** rolls within the high portion **46**a of the grooved cam **46** until the clamping members **43** and **44** reach the point of connection **39** and that the clamping members **43** and **44** lie on the radius line of the second turret base **42** with the member **44** of the clamping members **43** and **44** positioned on the outer diameter side of the base **42** and with the member **43** positioned on the inner diameter side of the base **42**. Accordingly, the closing operation of the member **44** at the point of connection **39** is carried out along the radius line, and the candy *a* which had packing paper b folded on its four sides by the rakeout turret **15** and which was transferred to the point of connection **39** is clamped in different positions by the second clamping members **43** and **44** which as described operate under control of the face cam **45** and grooved cam **46**, said different positions clamped by the members **43** and **44** being the portions intersecting at right angles with those portions of the candy a which the first clamping members **19** and **20** clamped, and at the same time therewith, the candy *a* is released, as described, from clamping by the members **19** and **20** and is transferred to the second transfer path **38** by a relay transfer turret **40**.

Immediately after the second clamping members **43** and **44** clamped the candy a on the outside surface of the folded packing paper at the point of connection **39**, the roller **58** is transferred from the high portion **46***a* of the grooved cam **46** to the low portion **46***c* through an inclined portion **46***b* by the continued counterclockwise rotation of the second turret base **42**. Accordingly, the gear **54** is rotated clockwise to thereby rotate the cylinder shaft **49** counterclockwise through 90° via the gear **52** to change the attitude of the shaft **49** and to face the unfolded portions b_7 and b_8 of packing paper (see FIG. **15-III**) to the outer circumferential side of the second transfer path **38**.

On the other hand, the sliding rod **55** slides along the low portion **45***b* of the face cam **45** and makes the second clamping members **43** and **44** keep their clamping of the candy *a* until the second clamping members **43** and **44** which rotated through 90° with the candy a clamped therebetween reach the immediate neighborhood of the terminal portion of the second transfer path **38**. And immediately before reaching the terminal portion of the path **38**, the sliding rod **55** slides on the inclined portion **45***c* of the face cam **45**, and is caused to project to the left in FIG. **8** to thereby move the clamping member **44** that brings the sector gear **44***a* into meshing with the rack **55***a* in direction in which the member **44** opens its clamp portion and to make the member **44** release at the terminal portion the clamping of the candy a_1 that finished its packing.

The sliding rod **55** is transferred from the inclined portion **45***c* of the face cam **45** to the low portion **45***b* thereof by the second turret base **42** being further rotated, and transfers the second clamping member **44** to a released position away the greatest distance from the clamping member **43**, and the roller **58** is transferred from the low portionn **46**c of the grooved cam **46** through a connection portion **46***d* to the high portion **46***a* thereof and, meantime, rotates the cylinder shaft **49** clockwise through 90° via gears **54** and **52** to thereby return the shaft **49** to the attitude which it took before clamping.

Namely, in the counterclockwise rotation of the second turret base **42** in synchronism with the rotation of the first turret base **18**, each pair of second clamping members **43** and **44** pivotally supported at equal spaces on the circumference of the turret base **42** clamp at the point of connection **39** the candy *a*, which is clamped by each pair of clamping members **19** and **20**, on the outside surface of the packing paper *b* in those positions of the candy *a* intersecting at right angles with those portions of the candy *a* which the members **19** and **20** clamp, and receive the candy a from the first clamping members **19** and **20** and are then caused to rotate through 90° to change their clamping attitude and to transfer the candy *a* along the second transfer path **38** and are returned to the attitude they took before clamping after having released their clamping at the terminal of the path **38**.

A swing member **62** and second folding members **65** and **66** are arranged on the second transfer path **38**,

said swing member **62** being adapted to fold that surplus end b_7 of packing paper *b* projecting behind the candy *a* in the direction of advance of the candy *a* turned about by the change in attitude made by counterclockwise rotation of the clamping members **43** and **44**, said second folding members **65** and **66** forming said second transfer path **38** and being adapted to fold other surplus ends b_8 and b_9 of the packing paper *b*.

The swing member **62** is fixed through a bolt **64**, etc. to a shaft **63** that is caused to make reciprocating arcuate movement through a mechanism (not shown) in synchronism with rotation of the second turret base **42**, and faces its ax-shaped bent portion **62***a* toward the outer circumference of the path **38** as shown in FIG. **9** so as to be moved in cooperation with the ends **65***a* of a second folding member **65**. Namely, the swing member **62**, in the clockwise rotation in its reciprocating arcuate rotation, folds the surplus end b_7 of the packing paper *b* projecting beyond the outside circumferential side of the path **38** over the open surface of a piece of candy *a* from behind by the ax-shaped bent portion **62***a*, said piece of candy *a* being clamped, turned about and advanced by the second clamping members **43** and **44**, and retreats counterclockwise from the candy *a*.

Second folding members **65** and **66** comprises a member **65** and an arcuately bent member **66**, said member **65** having its end **65***a* faced toward the position to which the ax-shaped bent portion **62***a* proceeds clockwise, said arcuately bent member **66** holding the member **65** through a holder **67** and forming the sides of the path **38** out of two side edges **66***a* and being fixed by means of a bracket **68** to the frame **4**. The member **65**, simultaneously with folding of the surplus end b_7 of packing paper *b* by the swing member **62**, folds by the counterclockwise advance of the second clamping members **43** and **44** the other surplus end b_8 over that outside surface of the portion in which the surplus end b_7 was bent by the ends **65***a* of the member **65**.

The folding member **65** is formed into a groove shape as shown in FIGS. **9**, **13** and **14**, and comprises the aforestated two side edges **65***a* and a bottom plate **66***c* having a V-shaped inclined edge **66***b* formed thereon in succession to the member **65**. The member **65** folds internally of the candy *a* by the inclined edge **66***b* the bent surplus ends b_9 projecting, as shown in FIG.. **15**-IV, on both sides of surplus ends b_7 and b_8 during the advance of the candy a along the transfer path **38**, said bent surplus ends b_9 being produced by the surplus ends b_7 and b_8 being folded by the swing member **62** and the member **65**, and finishes packing of the candy as shown in FIG. **15**-V and guides the packed candy a_1 to the terminal portion of the path **38**. The packed candy a_1 is released from clamping at the terminal portion of the second transfer path **38** as already stated.

Immediately below the terminal portion of the second transfer path **38**, as shown in FIGS. **1**, **2** and **8**, is arranged a receiving portion of an aligning transfer mechanism **69** which receives the packed pieces of candy a_1 laterally, groups the same by a specified quantity and pushes out the grouped lots horizontally one after another.

The aligning transfer mechanism **69** comprises a guide base **70** as shown in section in FIG. **8**, sprockets **71** driven at a specified ratio of speed to the turret bases **18** and **42** shown in FIGS. **1** and **2**, an endless chain belt **72** stretched over the sprockets **71**, a push feed rod **73** pivotally supported at specified spaces on the chain belt **72**, and a guide bar **74** fixedly arranged for regulating the attitude of the push feed rod **73**.

The guide base **70** includes a guide edge **70***a* and a slit **70***b*, said edge **70***a* receiving laterally (in the state in which the longitudinal direction of candy intersects at right angles with the direction in which the candy is transferred) the piece of candy *a* released from its clamping by the second clamping members **43** and **44** and regulating the direction of transfer of the piece of candy a_1, said slit **70***b* permitting the projection and movement of the push feed rod **73** therethrough, and receives the pieces of candy a_1 at the terminal portion of the second transfer path **38** as shown in FIG. **1**.

Each of the push feed rods **73** is formed into an L-shape as shown and is pivotally mounted by a pin **73***a* at equal spaces on the end less chain belt **72**, and when it reaches the initial end **74***a* of the guide bar **74** by driving of the chain belt **72**, the rod **73** presses a tail end portion **73***b* of the rod **73** into contact with the guide bar **74** and is caused to stand up and, while sliding the tail end portion **73***b* on the guide bar **74**, groups a certain number of pieces of candy a_1 on the guide base **70**, pushes the grouped pieces of candy a_1 toward the right in the drawing and, because the tail end portion **73***b* of the rod **73** is disengaged from the terminal **74***b* of the guide bar **74**, is turned counterclockwise around the pin **73***a* on its own weight and finishes the pushing in the state of the rod **73** being suspended from the chain belt **72**.

In the position in which the transfer mechanism **69** finishes the aforestated push feed operation is disposed a grouping guide channel **75** in such a position in which it intersects at right angles with the direction of transfer of the aligning transfer mechanism **69**. The channel **75** receives thereinto the pieces of candy a_1 grouped and aligned by a specified quantity in the state of the pieces of candy a_1 having been grouped and aligned. The push feed rod **73**, as described, is guided by the guide bar **74** so as to cease push feed in the position in which the rod **73** pushed the aligned pieces of candy a_1 into the channel **75**.

Within the guide channel **75** is disposed a separating swing plate **76** intersecting at right angles with the channel **75**, and the swing plate **76**, with the middle of the support arm **76***a* thereof pivotally supported at **77** on the frame **4**, brings a cam roller **78** at the tail end of the support arm **76***a* through a spring, etc. (not shown) into rotatable contact with a cam **79** rotatable by a mechanism (not shown) in synchronism with each specified quantity feeding cycle of the aligning transfer mechanism **60**, swings the swing plate **76** along the guide channel **75** by the roller **78** rolling along the circumference of the cam **78**, and transfers the aligned pieces of candy a_1 fed into the guide channel **75** in the longitudinal direction of the channel **75** in the state of the pieces of candy a_1 having been aligned, and transfers the packed pieces of candy a_1 to a box loading station.

Thus, this invention makes it possible not only to pack individual pieces of candy *a*, group and align the packed pieces of candy in specified numbers on an all-atuomatic basis but also to pave the way to automatic loading of candy in a box.

I claim:

1. A packing and aligning device for candy of square columnar hexahedron, said device comprising, in combination:

a rotary disk for receiving a large number of collectively thrown pieces of candy on the surface of the disk rotating horizontally;

a guide channel disposed on the circumference of said disk and designed to receive and transfer the pieces of candy on the disk in longitudinal alignment;

a feed channel for receiving pieces of candy from said guide channel into which they were received, said feed channel being formed in the side of the terminal thereof with an opening for taking out candy and with a receiving portion fronting said opening and adapted to receive packing paper cut into a specified size thereinto, and being further formed below said terminal portion and in the side opposite to said opening with a crossing path permitting the passage of a member clamping said candy therethrough;

packing paper feed means for cutting packing paper into a specified size and feeding the same to said packing paper receiving portion, said means including a mechanism for unrolling a long roll of packing paper and cutting said packing paper into specified lengths;

a takeout turret for clamping the pieces of candy in the terminal portion of said feed channel one by one together with the packing paper and transferring the candy thus clamped together with the paper along a first transfer path, said turret including a first turret base rotating at constant speed in the direction in which it crosses said feed channel, plural pairs of first clamping members pivotally supported at equal spaces on the circumference of said base and adapted to clamp said candy together with packing paper by the clamp portions thereof, and a set of first cam mechanism for controlling each of said clamping members so that the members make closing and opening operation in the direction of rotation of said base by rotation of the base, carry out said clamping in the terminal portion of said feed channel, and release said clamping at the terminal of said first transfer path;

first folding members positioned along the inner and outer circumferences and on both sides of said first transfer path and adapted for successively bending surplus ends of packing paper over the four sides adjacent to the front side of the piece of candy facing the inner and outer circumferences and both sides of said first transfer path, said surplus ends of packing paper being the surplus ends of the packing paper brought into clamped contact with the front side of said piece of candy;

a relay transfer turret for clamping at the terminal of the first transfer path the piece of candy clamped by said takeout turret, transferring the same along a second transfer path, and releasing said clamping at the terminal of the path, said turret including a second turret base rotating in synchronism with the first turret base, plural pairs of second clamping members pivotally supported at equal spaces on the circumference of said base and adapted to clamp the piece of candy in the terminal portion of the first transfer path, said piece of candy being clamped by said first clamping members, in the direction intersecting at right angles with the direction in which said first clamping members open and adapted to receive said piece of candy from the first clamping members, and second cam mechanisms for operating opening and closing of said clamping members at a specified position by rotation of said second turret base and for rotating said second clamping members, which clamped the piece of candy at said specified position, immediately after the members clamped the piece of candy and then changing the direction of transfer of the piece of candy;

a swing member positioned on the outer circumference of said second transfer path and adapted to swing in synchronism with rotation of said each turret base and to fold a surplus end of packing paper behind the piece of candy, said surplus end of packing paper projecting behind the direction of advance of the piece of candy which was changed in the direction of transfer by said cam mechanisms;

second folding members positioned on the outer circumference side of said second transfer path and adapted to fold over the folded surplus end of said front side a surplus end of packing paper on the front side of the piece of candy being transferred and then to fold the folded surplus ends jutting out on both folded sides internally and longitudinally of the piece of candy; and

an aligning and transfer mechanism designed to receive in a laterally aligned state the packed pieces of candy released at the terminal of said second transfer path from clamping by the relay transfer turret and to group, push and feed said packed pieces of candy by each specified quantity.

2. A device according to claim **1** comprising guide and transfer mechanisms designed to receive groups of pieces of candy packed in each specified quantity and being grouped and pushed in lateral alignment by said aligning and transfer mechanism and to transfer each group of packed pieces of candy in the direction intersecting at right angles with the direction of transfer of said aligning and transfer mechanism, said mechanisms feeding said each group of pieces of candy to a box loading station.

3. A device according to claim **1** wherein said rotary disk has a gently conically inclined plane, moves collectively thrown pieces of candy onto the disk by the gravity of the candy and rotating force of the disk in the direction of the outer circumference of the disk, aligns the pieces of candy in longitudinal alignment along the outer circumferential wall and transfers the candy in the direction of rotation of the disk.

4. A device according to claim **1** wherein saidi guide channel comprises an inside wall disposed on the outer circumference of said rotary disk and also functioning as an outside wall of said disk, an outside wall formed further outside of said inside wall and forming a path between the outside wall and the inside wall, along which path pieces of candy are transferred in longitudinal alignment, and a rotary bottom plate forming a bottom wall of the rotary disk and rotating in a specified direction.

5. A device according to claim **1** wherein said feed channel extends in succession to said guide channel tangentially of said rotary disk.

6. A device according to claim **1** wherein said first cam mechanism comprise cams imparting specified opening and closing operation to one member of said pair of first clamping members and a grooved cam im-

parting specified opening and closing operation to the other member.

7. A device according to claim 1 wherein said second cam mechanisms comprise a face cam imparting specified opening and closing operation to one member of said pair of second clamping members and a grooved cam imparting specified rotation to said clamping members.

8. A device according to claim 1 wherein said aligning and transfer mechanism comprises a guide base that receives packed pieces of candy in lateral alignment thereon, said packed pieces of candy being released at the terminal of said second transfer path from clamping by the relay transfer turret, plural push feed rods pivotally supported at equal spaces on an endless sprocket chain and driven in one direction, and a guide bar designed to regulate the attitude of said feed rods and to face the rods onto the surface of the guide base.

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