Feb. 19, 1957 L. G. FORSTER 2,781,887

MACHINE FOR COLLATING BISCUITS AND LIKE THIN ARTICLES FOR WRAPPING PURPOSES

Filed Nov. 10, 1953 4 Sheets-Sheet 1

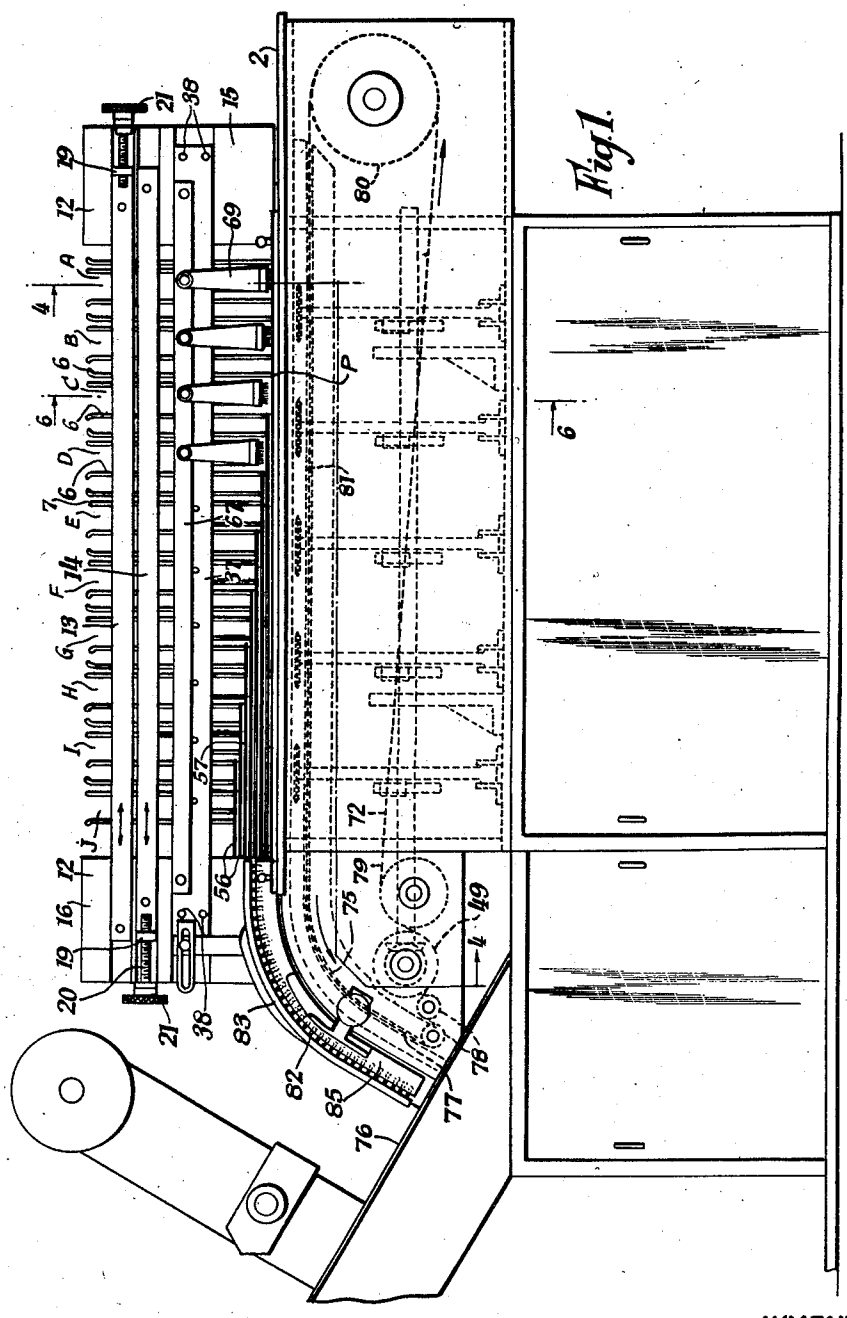


Fig. 1.

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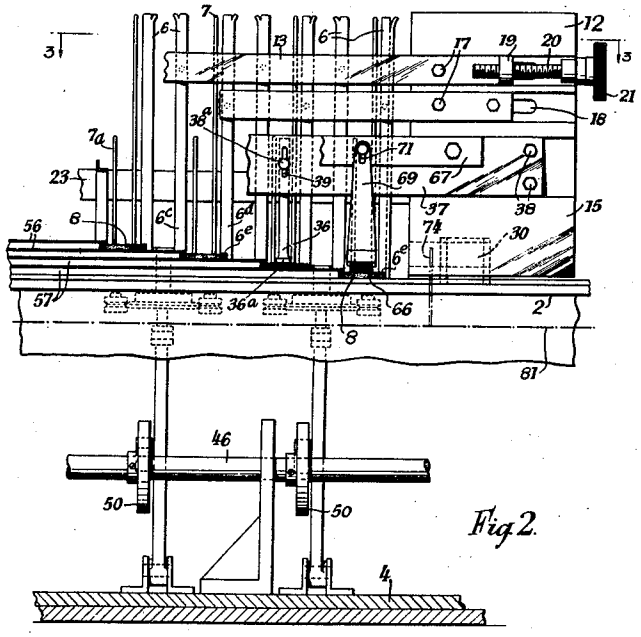


Fig. 2.

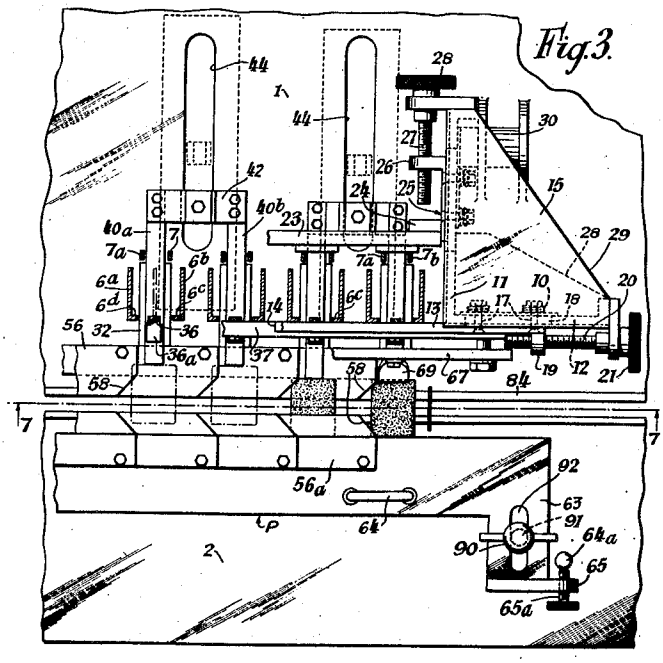


Fig. 3.

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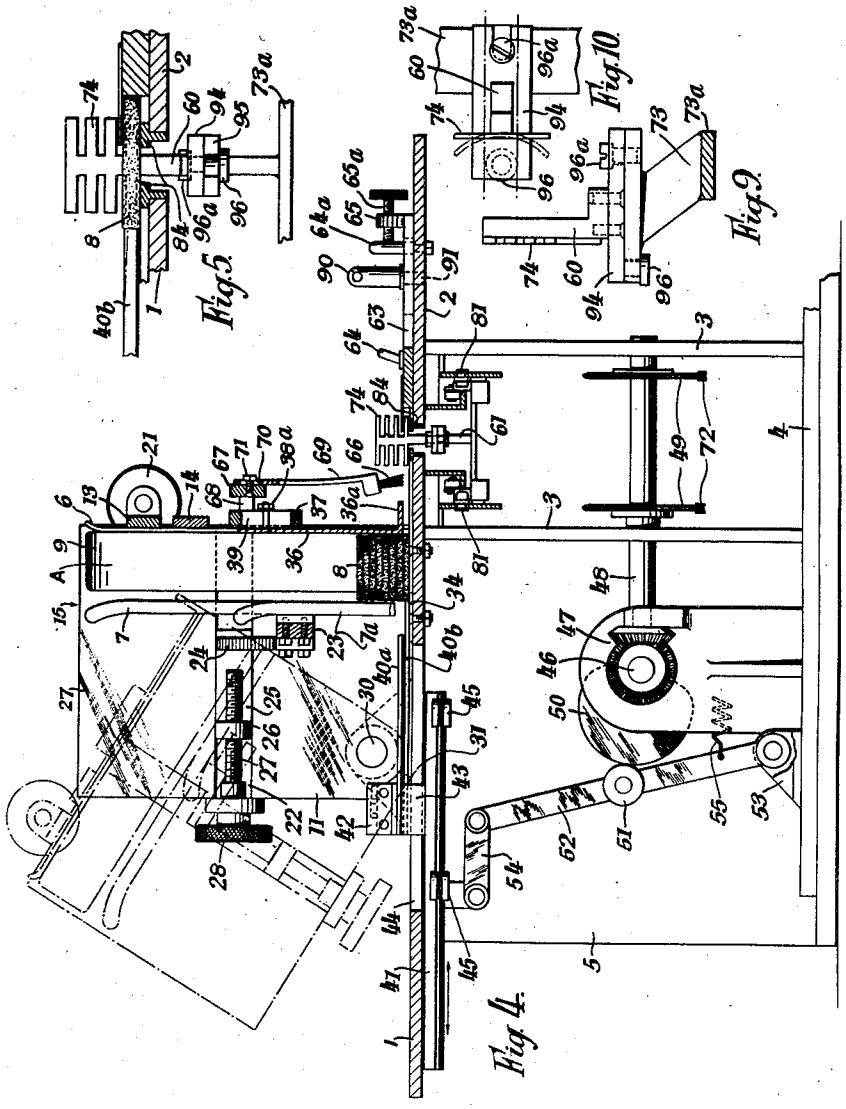


Fig. 4.

Fig. 5.

Fig. 9.

Fig. 10.

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MACHINE FOR COLLATING BISCUITS AND LIKE THIN ARTICLES FOR WRAPPING PURPOSES

Filed Nov. 10, 1953 4 Sheets-Sheet 4

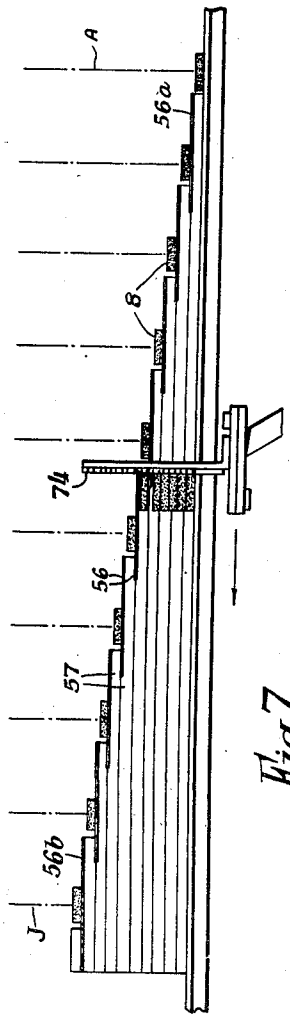


Fig. 7.

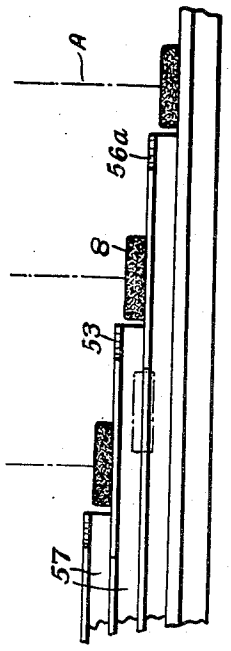


Fig 8

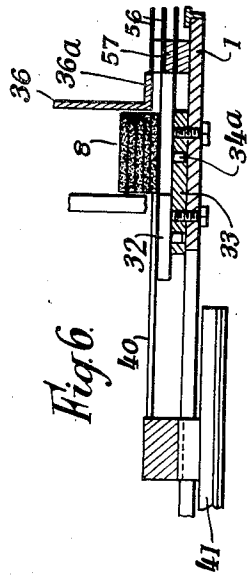


Fig 6

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United States Patent Office 2,781,887 Patented Feb. 19, 1957

2,781,887

MACHINE FOR COLLATING BISCUITS AND LIKE THIN ARTICLES FOR WRAPPING PURPOSES

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Application November 10, 1953, Serial No. 391,315

Claims priority, application Great Britain November 10, 1952

12 Claims. (Cl. 198—35)

This invention relates to a collating machine for biscuits and similar thin articles, in which the biscuits are assembled in piles or groups in succession and when so assembled or grouped may be delivered on to the bed of a wrapping machine. Collating machines of this kind comprise; substantially vertical hoppers in which the biscuits are first stacked, the lowermost biscuits in each pile being at different stepped levels; means for moving one or more of the lowermost biscuits in each pile transversely whereby a pile of biscuits is formed; and conveyor means for moving the piles of biscuits in succession longitudinally of the machine.

The biscuits are then moved along the bed of the wrapping machine by fingers on a continuously moving conveyor and as each group is moved along the said bed of the machine a length of thin covering material is wrapped around it, the material being folded and tucked so that the group or pile of biscuits is held together and is completely covered by said thin material. The bed of the wrapping machine may be horizontal or may be inclined upwardly.

One object of the invention is a machine which will operate continuously at high speed without damaging or breaking the biscuits.

Another object of the invention is the obtaining of automatic operation of the collating machine in conjunction with an automatic wrapping machine, whereby the collating and wrapping operations are entirely automatic after the biscuits have been placed in the hoppers.

It is another object of the invention to obtain improved control of the collating operation by moving each biscuit individually between two pairs of upper and lower horizontal guiding plates until each of said biscuits is allowed to bear upon the next lowermost biscuit.

Another object of the invention is the provision of two built up sets of horizontal guide plates with spacers therebetween disposed on opposite sides of the path of the fingers by which the piles of biscuits are moved longitudinally, the sets of guide plates for biscuits of different thicknesses being interchangeable.

It is another object of the invention to move each biscuit first transversely in superimposed relation to other transversely moved biscuits while separated therefrom by a horizontal guide plate, the biscuits so far assembled being then moved longitudinally by a conveyor finger with transverse arms until each biscuit moves beyond the end of its supporting guide plate and then rests upon the next lowermost biscuit.

It is a further object of the invention to construct all the hoppers so that corresponding movable components are readily adjustable simultaneously to accommodate biscuits of different dimensions.

In accordance with another object of the invention the movements of every biscuit are separately controlled right through their paths of movement until delivery to a wrapping machine takes place.

It is another object of the invention to enable the machine to be readily adapted for the collating of biscuits of widely varying dimensions in three directions.

It is a further object of the invention to provide for each biscuit to be individually stepped or moved into position in the pile and to select the order in which each biscuit is stepped whereby too large a step or drop may be avoided by arranging the stepping to take place in groups.

According to a further object of the invention, the machine may be cleaned and cleared of debris by providing simple means for tilting the hopper assembly clear of the guide plates and operating fingers, by making one of the sets of guide plates readily removable, and by providing in the bed a slot along which the conveyor fingers move.

It is a further object of the invention to connect the fingers having transverse arms and projecting upwards from moving conveyor elements in a readily detachable manner which enables them to be readily interchangeable with other fingers adapted to deal with biscuits of rectangular or other shapes or dimensions, including thickness, and also thereby to adjust the relationship between the movement of the conveyor fingers and the movements of the transverse plungers by which the lowermost biscuit is removed from the pile.

It is a still further object of the invention to build up a plurality of piles of biscuits simultaneously due to the timing in sequence of the transverse plungers, each of which may be operated several times, for example three times during the movement of each conveyor finger lengthwise along the row of hoppers, whereby several fingers are simultaneously in action providing maximum output capacity.

In the embodiment of the invention shown by way of example in the accompanying drawings:

Figure 1 is a side elevation of the complete collating machine with parts removed;

Figure 2 is a part elevation corresponding to Figure 1 and showing four hoppers on a larger scale;

Figure 3 is a part sectional plan taken on the line 3—3 of Figure 2;

Figure 4 is a transverse vertical section taken on the line 4—4 of Figure 1;

Figure 5 shows a part of Figure 4 to a larger scale;

Figure 6 shows a part transverse vertical section taken on the line 6—6 of Figure 1;

Figure 7 shows a part vertical section on the line 7—7 of Figure 3, that is on the central plane of the machine;

Figure 8 is an enlarged fragmentary view of the right end of Figure 7;

Figure 9 shows a detail of a conveyor finger in addition to the detail shown in Figure 7; and,

Figure 10 shows a plan of Figure 9.

The machine includes a plurality of hoppers, the biscuits or other thin articles being placed in these hoppers by one or more attendants. In the arrangement shown ten hoppers are employed so that the maximum number of biscuits which could be assembled to form a package is ten. These hoppers need not, however, all be employed; for example four hoppers only, as illustrated, could be used to assemble packets of four biscuits, the lowermost biscuit from one of the hoppers resting directly upon the lowermost guide or supporting plate or upon the bed of the machine.

The machine comprises broadly four groups of components. (1) The first group consists of the hoppers above referred to. (2) The second group includes plunger mechanism by means of which the lowermost biscuit in each pile is moved laterally, the said lowermost biscuit from each of the piles being superimposed on one another. (3) The third group includes a number of horizontal guide plates spaced vertically and interposed

between the separate biscuits over some part of the path of movement of the assembly towards the wrapping conveyor. (4) The fourth group relates to a continuously moving conveyor having operating fingers movable between the horizontal guide plates.

The machine includes a bed plate in two parts **1**, **2** separated from one another by a gap running longitudinally in which gap the conveyor fingers move lengthwise of the machine. The bed is supported by vertical plates or a framework **3** from a base **4** and transverse supporting members **5** are provided for the extending part of part **1** of the bed plate. The hopper group (1) is supported above part **1** of the bed plate. The plunger group (2) with its operating mechanism is supported partly above and partly below part **1** of the bed plate. Group (3) is supported above both parts **1** and **2** of the bed plate and group (4) is supported generally below the two parts of the bed plate with the fingers extending above through the aforementioned gap between parts **1** and **2**.

Each hopper is built up from two vertical angle members **6** and two vertical back rods **7**, *7a* and is located adjacent but to one side of the conveyor. The angle members are so spaced as to receive two of the corners of the rectangular biscuits **8** and they may be adjusted towards and away from one another, that is lengthwise of the machine, to suit biscuits of different dimensions. The vertical back rods **7**, which are also adjustable but transversely of the machine, are positioned close to the other ends of the biscuits **8**; that is to say, the end remote from the conveyor, so as to hold the biscuits in the appropriate position adjacent the angle members. One of the back rods *7a* in each hopper is substantially shorter than the other rod **7** to facilitate loading. The two rods in each hopper may, however, be replaced by a single flat plate, the flat surface of which engages the ends of the biscuits so as to hold them in position adjacent the corners of the angle members **6**. The sides **9** of the angle members are substantially longer than the ends **12** to prevent rotational movement of the biscuits. The upper ends of the angle members and the back rods are flared outwardly to facilitate loading of the hoppers. It will be understood that the vertical hopper members will always be adjusted to allow sufficient slack to avoid risk of jamming of the biscuits.

The same machine may collate biscuits of widely differing dimensions. Moreover, biscuits or other articles of other shapes than rectangular may be assembled thereby; for example, biscuits or the like of circular or oval form. The conveyor fingers may be shaped to fit such biscuits. The two angle members **6** of each hopper may be moved towards or away from one another to allow the hopper to operate with biscuits of different dimensions in the direction of the length of the machine; that is parallel to the movement of the conveyor fingers. To facilitate adjustment of all the left hand angle members simultaneously in one direction and all the right hand angle members in the opposite direction, the two sets of angle members are secured respectively by rigid connections to two horizontal bars **13**, **14** carried by end brackets **15**, **16**. Each bar is guided accurately by guiding means such as a channel on one face of each end bracket. The bars may be held with the necessary degree of firmness against the bottom of this channel by any suitable means; for example a dovetail connection may be provided or spring clamping means in which set bolts or studs **17** on the bars **13**, **14** extend through slots **18** in the bracket, the necessary pressure being exerted through short stiff helical springs encircling the bolts.

Each bar is formed at one end with a lug **19**, which is engaged by a screw **20** rotatable by a knurled head **21** or equivalent means whereby the bar and all the angle members secured thereto may be simultaneously adjusted lengthwise of the machine. The left hand set of angle members and its bar **13** may be adjusted by the screw mechanism **22** on one bracket **15** and the right hand set by similar mechanism on the other bracket **16**. Alternatively, mechanism may be provided by which the two bars **13**, **14** carrying the angle members **6** may be simultaneously adjusted in opposite directions by a single control member such as a hand wheel.

The vertical back rods **7**, *7a*, or alternatively the flat plates referred to previously, are all rigidly connected to a longitudinal bar **23** secured at its ends, through vertical connections **24**, to two slides **25** which are each adjustable horizontally in a channel on the face of one angle of the end brackets **15**, **16**. A lug **26** at one end of each slide is adjusted by a screw **27** having a knurled head **28**. This adjusting means enables the back rods **7**, *7a* to be adjusted towards and away from the angle members **6** in directions at right angles to the length of the machine to suit biscuits of varying dimensions.

All the hoppers and the associated mechanism are thus carried on the two end brackets **15**, **16**, each of which is formed with two vertical members **26**, **27** at right angles to one another and stiffened by a lower horizontal angle member **28** and a similar upper angle member **29**. The end brackets are pivotally mounted in bearings **30** on the part **1** of the table so that the whole assembly may be tilted away from its operative position to the position shown in dotted lines in Figure 4 to give ready access to the various components and facilitate adjustments, clearing and cleaning. In this position, the assembly is slightly overbalanced so that the corners **31** of the brackets **15**, **16** bear upon the table.

The lowermost biscuits in each pile in each hopper are at different levels so that the biscuits delivered from each of the hoppers working at any time may be superimposed upon one another. Each of the piles of biscuits with the exception of the lowest end pile is for this reason supported upon a readily removable base block **32** and a fixed base block **33**, these blocks being of different thicknesses. The lowest biscuit in each assembly of biscuits may rest directly upon a thin base block **34** which bears upon and is secured to the table. The fixed base blocks **33** are secured to part **1** of the table by bolts or set screws and increase in thickness from right to left as viewed in Figure 1. The readily removable base blocks **32** are each held in position on its fixed block **33** by spigots **34** to prevent horizontal movement. The removable base blocks **32** of variable thickness are changed when required to suit any thickness of the biscuits to be assembled. In each hopper the height of the removable base block is such as to allow the necessary transverse movement of the lowermost biscuit in the pile into the path of the conveyor fingers by mechanism to be hereinafter described.

The long sides *6a*, *6b* of the angle members **6** in each hopper preferably extend down to or close to the common removable base block, but the short sides *6c*, *6d* of the angles are cut away at their lower ends as indicated at *6e*. These cut-away parts extend upwards, to at least a sufficient height to allow movement of the lowermost biscuit transversely of the machine. The cut away part may, however, extend above the lowermost biscuit so that each hopper is not limited to dealing with columns in which the lowermost biscuit is at one height only. Two or more biscuits may lie within the vertical range of these cut away parts which should be of such a length as to accommodate any probable thickness of hopper base blocks **32**, **33** and any thickness of biscuit within the range for which the machine is designed.

To prevent the biscuits, other than the lowermost one in each pile, from being moved by the transverse movement of the lowermost biscuit, vertical strips **36** are secured rigidly to a horizontal bar **37** mounted by set

bolts 38 or the like on the end brackets 15, 16. The strips are each located between the short arms of two associated angle members, the lowermost end 36*a* being at such a level that only the lowermost biscuit in each hopper can be moved transversely. Each of the strips 36 is independently adjustable vertically relatively to the bar 37, for example by a stud or set bolt 38 passing through a slot 39 in the bar 37.

Referring now to the second group aforementioned comprising means for moving the lowermost biscuits transversely, each of the lowermost biscuits is moved by a plunger 40 which is operated in a horizontal direction transversely of the machine so as to push the biscuit into the longitudinal path of the conveyor fingers. These plungers may be operated in pairs by slides 41; in the example shown, where ten hoppers with ten plungers are provided, two adjacent plungers co-operating with adjacent hoppers will be carried by one slide. The plungers 40 may be secured in pairs to a cross plate 42, one plunger 40*a* being at a higher level than the other 40*b* and the cross plate being secured to its slide 41.

The connections between these several components may allow for adjustment according to the dimensions of the biscuits being assembled. As an alternative, if provision is not made for such adjustment, the cross plates 42 or other parts connected therewith may be removed and replaced by similar parts of different dimensions.

The slides 41 located below part 1 of the table are guided accurately by ball or other bearings 45. Each cross plate 42 is connected to its slide by a stem 43 passing through a slot 44 in the table.

The slides are reciprocated transversely by cam mechanism in which a shaft 46 running lengthwise of the machine is supported in bearings (not shown) and is driven at one end through bevel gearing 47, from a transverse spindle 48 carrying wheels or sprockets 49 forming part of the chain conveyor system to be described hereinafter. Radial cams 50 are secured to the spindle 46 at spaced intervals and each cam operates a roller 51 carried on a lever 52 pivoted at its lower end to a bracket 53 on the base 4 of the machine while its upper end is connected by a link 54 to the slide 41. Each roller 51 is kept in contact with its cam by a spring 55. The cams are spaced equiangularly around the shaft 46, so as to operate each slide and its two associated plungers at an appropriate time in relation to the movement of the conveyor fingers lengthwise of the machine. The lowermost biscuit from each hopper is thus moved transversely into the path of a conveyor finger at the appropriate time.

Turning now to the third group comprising horizontal guide plates 56 between which the biscuits are pushed by the plungers 40 into the path of the conveyor fingers, the number of guide plates employed is one less than the number of biscuits. The guide plates and the spacing members 57 interposed between them all extend from the leaving end of the first hopper A to a point about the width of a hopper beyond the last hopper J. In the arrangement shown particularly in Figure 7, in which ten biscuits are assembled, the overall lengths vary from a maximum for the lowermost guide plate 56*a* to a minimum for the uppermost guide plate 56*b*. The entering ends of the guide plates are thus stepped horizontally while their leaving ends lie in the same transverse plane. When the machine is operating with a smaller number of biscuits, the early part of the foregoing order of assembly could be followed. The operative parts of the guides which extend towards the path of movement of the fingers and support the biscuits after they have been pushed out of the hoppers are, however, of varying and shorter lengths in accordance with the order in which the biscuits in each pile are intended to drop into contact with the next lowermost biscuits. The operative parts of the guides are cut away at an angle at the entering ends as shown at 58. This arrangement of the operative parts of the guides to give a particular order of assembly is given by way of example, since other arrangements could be employed.

Two series of guide plates 56 are provided with a gap between them to allow movement of the central vertical stems 60 of the conveyor fingers 61. The guide plates in each set are spaced vertically by the spacing members 57 of suitable thickness to allow free movement of the biscuits. Each of the two sets of guide plates and spacing members may be built up according to requirements to suit the dimensions of the biscuits vertically of the machine.

The guide plates are spaced vertically the smallest distance consistent with all biscuits of the size for which the machine is adjusted moving freely without jamming between their upper and lower guides whatever the normal variations of thickness. When a guide terminates, a biscuit drops a short distance on to the one below it.

One set of guide plates and spacing members 57 on the same side of the conveyor as the hoppers A—J is fixed in position, while the corresponding set on the other side of the conveyor fingers may be made movable transversely of the machine to facilitate cleaning and clearing of broken biscuits. With this object, the movable guide plate assembly P is supported by plates 63 which bear upon part 2 of the supporting table and are adapted to be moved transversely by any suitable means. For example handles 64 may be secured to transverse extensions from the plate 63. When the plate 63 and the assembly P is pushed forward into its operative position, it may be accurately positioned by stops 64 fixed to the bed 2 while co-operating lugs 65 on plate 63 carry adjustable screws 64 engaging the stops 64. Alternatively, the guide plate assembly P when in its operative position may be held by spring catches.

The movement of each biscuit transversely by the plungers 40 is retarded by a brush 66 engaging its upper surface lightly to prevent any unintended movement during transverse movement after leaving the hopper until it is moved longitudinally by the conveyor fingers clear of the brushes and between the guide plates. The brushes are supported at different heights from a horizontal bar 67 running lengthwise of the machine, the ends of the bar being connected to the longitudinal bar 37 by means of posts 68. Each brush 66 is carried by a vertical arm 69 with a slot 70 therein so that the height of the brush may be adjusted to suit the height of the corresponding biscuit. A securing bolt or stud 71 screwed into or secured in the bar 67 passes through the slot 70. Each brush is located behind the cut-away end of the upper of the two guide plates between which the biscuit moves. The biscuit then bears upon the lower guide plate. The biscuit when in position centrally of the conveyor is engaged by the conveyor finger 61 and is then moved forward under the upper guide plate.

Each of the biscuits of a pair when moved transversely each by its plunger 40, is thus left, when its plunger 40 is withdrawn, resting upon one of the longitudinal guide plates and is held against accidental or unintended movement by its brush 66, the biscuits being at different levels one step apart. The conveyor finger engages first one biscuit generally that at the lower level and then as it moves further the other biscuit of the pair.

Referring to the fourth, or conveyor group, a pair of endless chains 72 run over a series of pulleys or sprockets. The upper runs 81 of the chains extend horizontally beneath the bed 1, 2, and are guided by suitable means such as pins or rollers and guide bars. Operating fingers 61 are supported at spaced intervals along the chain by means of carriers which are each formed with a central stem 73 to which is adjustably secured the central stem 60 of the finger by a readily detachable connection including a plate 94 carrying stem 60, connected to a lower plate 95 on stem 73 by a headed pin 96 on plate 94 entering a slot in the plate 95 and a screw 96*a* entering a slot in plate 94. Arms 74 extending laterally on each side of the

central stem 60 are so spaced as to move between the longitudinal guide plates, each pair of arms 74 at the same level thus engaging one of the biscuits. The pairs of arms at the same level on each finger thus come into operation in succession as the finger moves forward until all the arms are engaging a biscuit, the front edges of the biscuit being level with one another.

The machine, as mentioned previously, is adapted to deal with ten or a smaller number of biscuits, only four being actually shown in operation in the drawings. The fingers may be made with ten pairs of arms, or with a lesser number when the machine is operating on a long run of smaller assemblies.

At the delivery end, the conveyor chain runs over a curved guide 75 by means of which the pile of biscuits is turned during its forward and downward progress through an angle of about 60° so that it may be delivered on to the bed 76 of the wrapping machine, the bed being inclined at an angle of about 30° to the horizontal. The end of this curved path thus terminates in a short straight run 77. The conveyor chain as the fingers 60, 61 approach or move into this short straight run pass over pulleys 78 by means of which the movement of each finger is arrested and the finger is withdrawn clear of the track of the biscuits with or without an intermediate rearward movement. The fingers are then led back along the return run 79 of the chain until they pass round the rearmost wheel or sprocket 80 and again come into an operative position along the top run 81 of the chain.

Each pile of biscuits, when it leaves the ends of the guide plates is moved round the curved guide 75 by the conveyor fingers 60, 61, the top of each pile being retarded slightly by brushes 82 projecting from guide bar 83 secured in a suitable position relatively to the curved guide on which the lowermost biscuit in each group bears after leaving the lowermost supporting plates 84. Side guides 85 adjustable to the width of biscuit are also provided so that each group of biscuits moves in a channel shaped guiding path and is pressed lightly into this path by the brushes on the guide bar 83. When each pile of biscuits reaches the end of its movement, a conveyor finger movable upwards along the inclined bed 76 of the wrapping machine, engages the previously lowermost biscuit and the assembly of biscuits is then moved clear of the collating track and upwardly along the inclined bed of the wrapping machine while the various wrapping operations are carried out.

In the examples shown, the biscuits when delivered onto the inclined bed of the wrapping machine are at right angles thereto. The piles of biscuits may, however, be so guided after leaving the collating apparatus that the flat face of the undermost biscuit rests upon the bed of the wrapping machine.

The sides of the gap between the two parts 1, 2 of the bed are in line with lengths 84 of T section material. The upper surfaces of these lengths 84 are in line with the upper faces of the fixed supporting bars associated with the end hopper A. The lowermost biscuit in each group is thus supported by the said upper faces for the whole length of its movement along the machine.

I claim:

1. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions from the stem; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

2. Collating machine as claimed in claim 1, comprising; means for moving the guide plate and spacing block assembly on the opposite side of the conveyor from the hoppers away from its operative position to facilitate cleaning and clearing of debris.

3. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; vertical spacing blocks interposed between said horizontal guide plates, the spacing blocks being greater in thickness than the thickness of the biscuits, the edges of the spacing blocks facing one another transversely of the machine being clear of the ends of the pushers on the conveyor fingers, while the operative supporting parts of the two sets of guide plates extend towards one another from the two opposite sides, leaving between their inner edges a gap sufficient for the conveyor fingers to pass; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

4. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates, the guide plates being formed with their operative ends, on which the biscuits are first placed, stepped forwardly by an amount equal to the longitudinal spacing of the hoppers; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

5. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates, the leaving ends of the operative parts of the guide plates extending to varying distances longitudinally thereby determining the position of each biscuit when it is allowed to rest upon the next lowermost biscuit; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

6. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in opposite directions from the stem; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a construction of each of said hoppers for rectangular biscuits comprising two vertical guide plates of angle section with unequal sides guiding two adjacent corners of the biscuit and located on that side of the hopper adjacent one set of horizontal guide plates and at least one rear vertical bar engaging with some degree of slackness the opposite side of the biscuits; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

7. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a construction of each of said hoppers for biscuits each having a curved outline, comprising two vertical guide plates of curved section on that side of the hopper adjacent one set of horizontal guide plates and at least one oppositely disposed vertical bar whereby movement transversely or longitudinally of the biscuits, other than the lowermost biscuit, is avoided; and a transversely reciprocable plunger for each hopper located at such a height that its end engages an edge of the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

8. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in opposite directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a removable base plate at the bottom of each hopper on which the lowermost biscuits bears, the base plates being of different stepped heights whereby each of said lowermost biscuits is at a level corresponding to the gap between two vertically spaced guide plates; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

9. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a multiple hopper assembly including two end brackets, one longitudinal supporting bar for a first vertical guide plate on each hopper adjacent the horizontal guide plates, a second longitudinal supporting bar for a second vertical plate on each hopper also adjacent the horizontal guide plates, an adjustable longitudinally slidable connection between each end of each supporting bar and each of the end brackets, a third longitudinal supporting bar for the rear vertical bar or bars of each of the hoppers, supports adjustable transversely of the machine between the ends of the said third bar and the end brackets, and pivotal supports for each end bracket whereby the multiple hopper assembly may be tilted away from the horizontal guide plates and the conveyor to give access thereto; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

10. Collating machine as claimed in claim 9, comprising; longitudinally spaced brushes carried by a longitudinal bar supported by said end brackets, said brushes engaging lightly the upper surfaces of the biscuits when they are moved transversely by the plungers.

11. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in both directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a construction of each of said hoppers comprising two vertical guide plates of angle section with unequal sides guiding two adjacent corners of the biscuit and a rear vertical bar or bars engaging with some degree of slackness the side of the biscuits opposite the side between said angle plates; means for adjusting the vertical angle plates of each hopper simultaneously towards or away from one another in longitudinal directions to accommodate biscuits of different dimensions in one direction; means for adjusting said vertical bars simultaneously transversely to accommodate biscuits of different dimensions in a second direction; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

12. Collating machine comprising; a series of longitudinally movable conveyor fingers, each finger having a plurality of pairs of vertically spaced operating arms, the arms of each pair extending transversely in opposite directions; two sets of vertically spaced horizontal guide plates located on opposite sides of said fingers and leaving a space therebetween through which the said fingers move longitudinally while the said arms move between the plates; a plurality of vertical hoppers in which the biscuits to be assembled are first stacked with the lowermost biscuits at different heights, said hoppers being located along one side of the machine adjacent one of said sets of horizontal guide plates; a construction of each of said hoppers comprising two vertical guide plates located on that side of the hopper adjacent one set of horizontal guide plates and at least one rear vertical bar engaging with

some degree of slackness the sides of the biscuits opposite the sides between the vertical guide plates, the vertical guide plates being partly cut away at their lower ends to at least a sufficient height to allow transverse movement of the lowermost biscuit; vertical strips secured adjustably as to height relatively to the hoppers whereby the biscuits other than the lowermost biscuit, are prevented from moving transversely towards the horizontal guide plates and the conveyor fingers; and a transversely reciprocable plunger for each hopper located at such a height that its end engages the lowermost biscuit and pushes said biscuit between the corresponding guide plates and in front of a conveyor finger.

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