May 27, 1952 A. G. ROSE ET AL 2,598,071

CARTON OPENING MACHINE

Filed Feb. 25, 1947 3 Sheets-Sheet 1

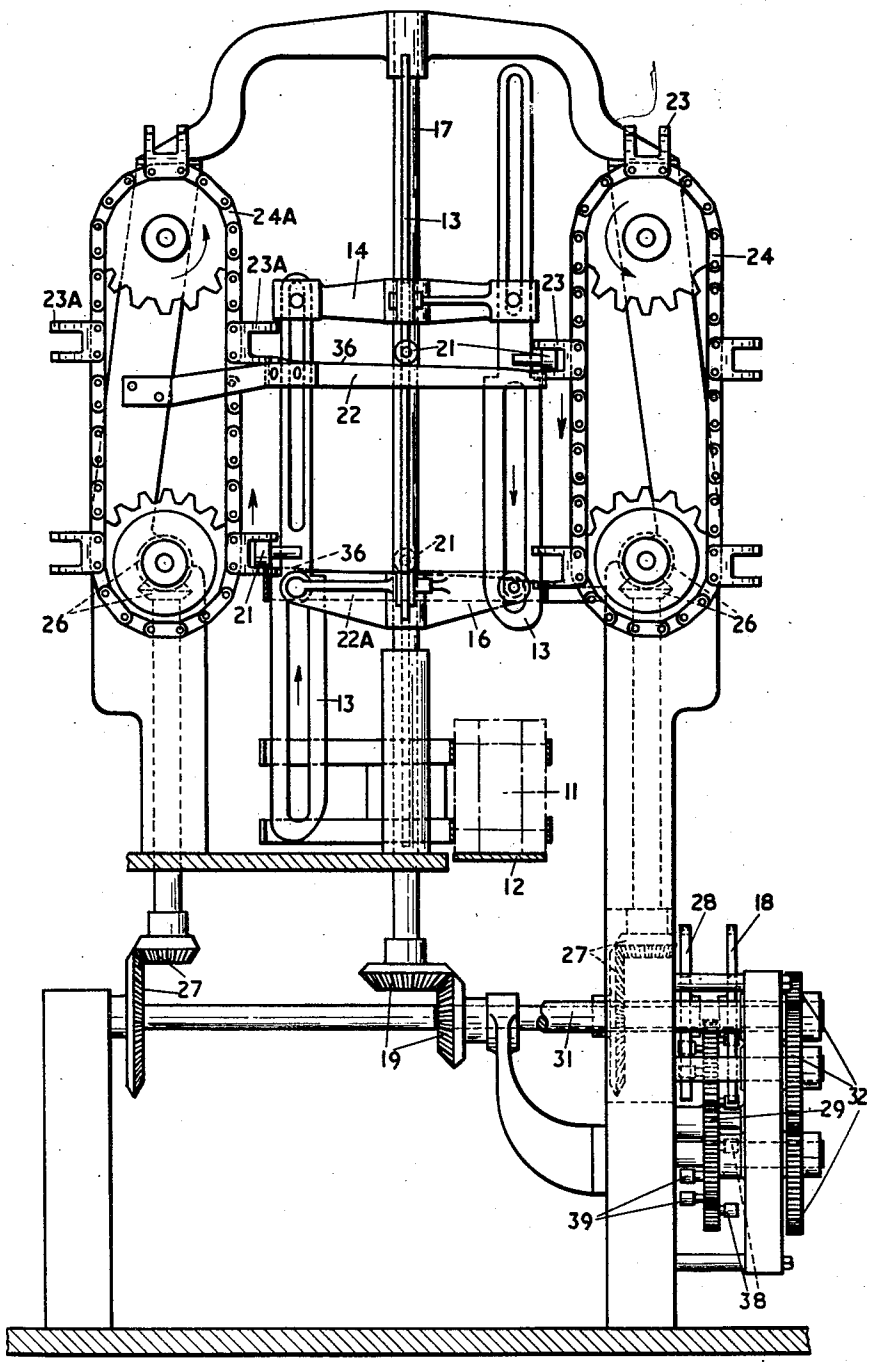


FIG.1.

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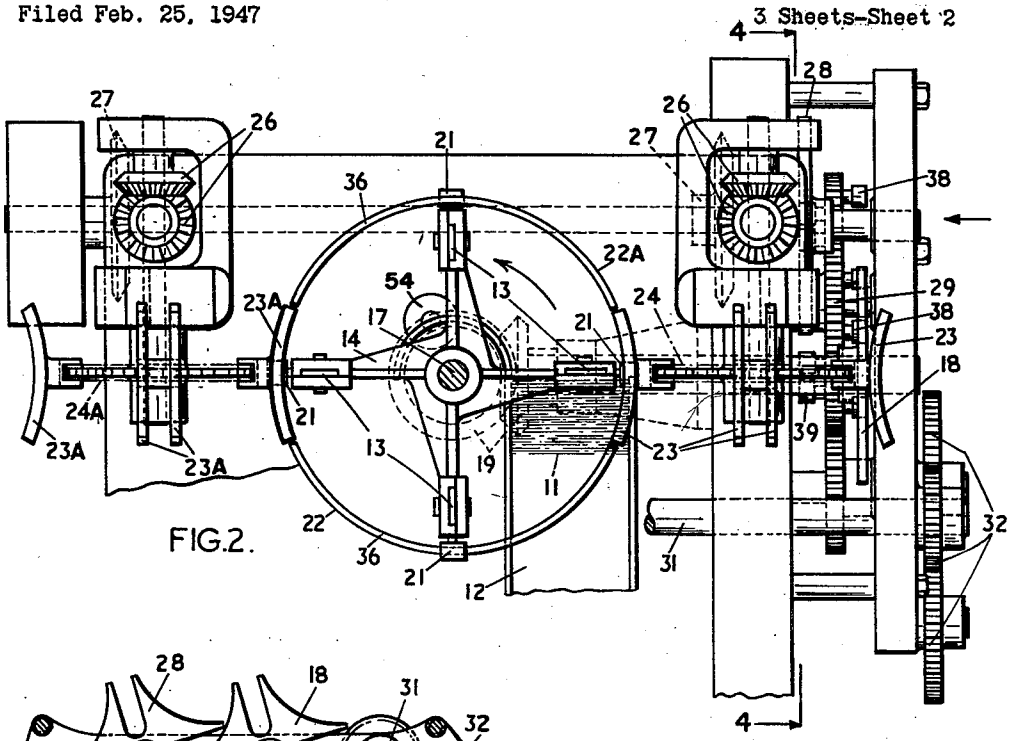


FIG.2.

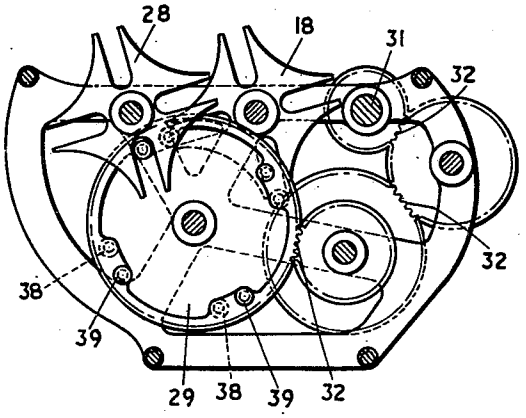
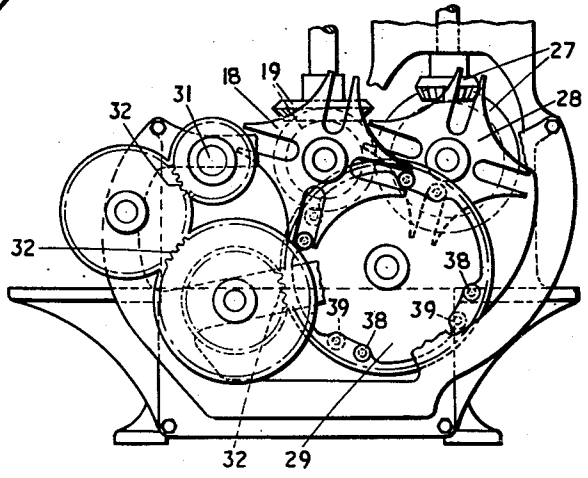


FIG.4.

FIG. 3.



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Filed Feb. 25, 1947 3 Sheets-Sheet 3

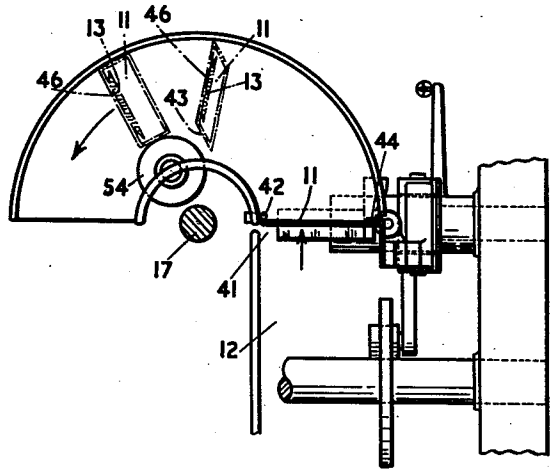


FIG. 5.

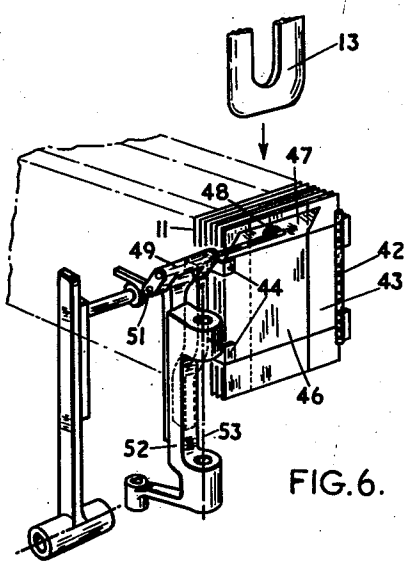


FIG. 6.

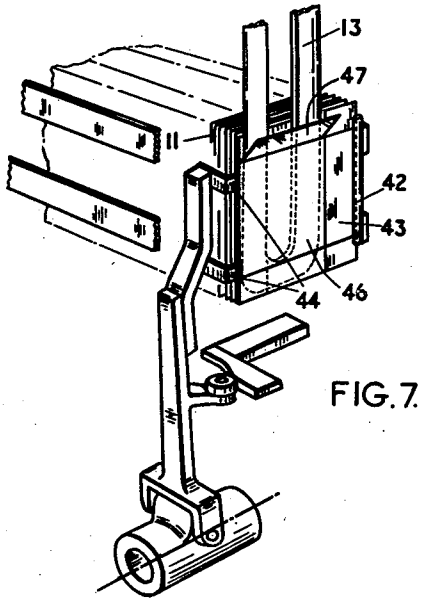


FIG. 7.

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Patented May 27, 1952

2,598,071

UNITED STATES PATENT OFFICE

2,598,071

CARTON OPENING MACHINE

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Application February 25, 1947, Serial No. 730,808
In Great Britain February 26, 1946

5 Claims. (Cl. 93—53)

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This invention relates to carton feeding apparatus of the same general construction as that described in United States Patent No. 2,134,418 comprising a plurality of transfer blades spaced apart at equal intervals around a closed path, means for translating said blades together unidirectionally around said path to bring each blade in turn to a separating station, means operable in timed sequence with the translation of said blades for moving each transfer blade in turn in an endwise direction to insert it between the front and rear portions of the leading carton, and means operable at a subsequent station in the path of translation of said blade to effect the endwise withdrawal of the inserted blade from engagement with the carton.

According to the present invention, there is provided an apparatus of the above kind, wherein at least a substantial portion of the endwise movement of the transfer blades is effected while the blades are translating round said path. By these means, the apparatus has a smoother action which permits of high speed being attained without undue noise and vibration.

As in the patent mentioned above, the transfer blades are preferably mounted on a carrier member at equal angular intervals, and the means for effecting the endwise movement of the transfer blades are conveniently in the form of two endless chains intermittently driven in timed sequence with the intermittent rotation of the carrier member and co-operating projections on the transfer blades arranged to ride, during the rotation of the carrier member, along fixed arcuate guide rails located circumferentially with respect to the axis of the carrier member, and to be guided thereby into and out of engagement with the endless chains.

For engaging the projections on the transfer blades, the endless chains are provided, in accordance with this invention, with a series of arcuate guides extending transversely of the chains are provided, in accordance with this invention, with a series of arcuate guides extending transversely of the chains for a substantial distance on each side of the chains and each representing, when in the position of engagement with the projections, on the transfer blades, a continuation of the arcuate guide rails mentioned above. According to a feature of the invention, the arcuate guide rails are formed with a spiral guiding path so as to cause the transfer blades approaching the chains to commence their endwise movement before their projections engage the arcuate guides on the chains, the inclination

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of the spiral path being such that, at the point of engagement of a projection with the arcuate guide on the chain, the vertical component of the velocity of the projection is substantially equal to that of the arcuate guide on the chain. The projections on the transfer blades are conveniently provided with freely mounted rollers, the rollers being formed with inner and outer metal sleeves and an intermediate body portion of rubber.

Conveniently, the endless chains and the carrier member are each driven by Geneva mechanisms operating in timed sequence and, according to a further feature of the present invention, the Geneva mechanisms are each operated by a crank wheel having several rollers so disposed that as one roller leaves a slot in the Geneva wheel another enters the next succeeding slot so that the period of rest is substantially instantaneous.

The invention will now be described in greater detail with reference to the accompanying diagrammatic drawings, in which

Figure 1 is an elevation of a part of a carton feeding apparatus according to the invention,

Figure 2 is a partial plan view of part of the apparatus shown in Figure 1,

Figure 3 is an end view of part of the apparatus shown in Figures 1 and 2 viewed in the direction of the arrow in Figure 2,

Figure 4 is a sectional view of part of the apparatus shown in Figures 1 and 2 taken on the line 4—4 in Figure 2,

Figure 5 is a fragmentary plan view illustrating the opening out of the carton during its transfer, and

Figures 6 and 7 are perspective views illustrating the commencement of the carton-opening operation.

The machine is of the same general construction as that described in United States Patent No. 2,134,418, patented October 25, 1928, which is concerned with apparatus for distending or setting up, prior to filling, collapsible cartons of cardboard or similar material and of the well known type comprising a tubular rectangular body portion constituting the four sides of the carton and hinged end flaps which are extensions of the sides and are adapted to be bent over at right angles to form the end closures. The apparatus is of the type in which the empty cartons are fed, e. g., towards a filling machine in pack formation one behind the other, and each in a flat collapsed condition, that is with the end flaps extending in the same planes as the sides

of which they are continuations, and with two conjoined sides and their respective end flaps lying flat against the other two sides and their end flaps.

The general construction and operation of the apparatus is fully described in the specification mentioned above, and it will only be necessary, therefore, to describe herein the salient features of the known apparatus, reference being made to the above mentioned specification for further details of the apparatus as a whole.

Briefly, collapsed cartons 11 are fed in succession from a stack on a conveyor 12 by a series of transfer blades 13 slidably mounted for movement in a vertical direction on a carrier member consisting of upper and lower spiders 14 and 16 secured to a rotatable shaft 17 arranged to be intermittently rotated by means of a Geneva mechanism 18 through a pair of bevel gears 19. The stack of cartons 11 is urged by the conveyor 12 towards a separating station (generally indicated by the reference numeral 41 in Figure 5) where the leading carton of the stack is arrested by means of a fixed stop member 42 in the form of a roller located parallel to the face of the stack and arranged to engage marginally the front narrow side 43 of the carton, and by a movable stop 44 arranged to engage marginally the front broad side 46 of the carton. Figure 6 shows the two stop members 42 and 44 in their engaging positions.

As explained more fully in the patent mentioned above, preparatory to the entry of the blade 13 at the separating station, the upper broad end flap 47 of the carton is bent outwardly (see Figures 6 and 7) by a suction gripper 48 carried on an arm 49 arranged to be rocked about a horizontal axis 51, the arm 49 being itself carried on an arm 52 movable about a vertical axis 53 to move the gripper 48 and its supporting arm clear of the stack.

The blade 13 is then inserted through the gap presented by the outwardly bent flap 47 into the inside of the flattened carton (the blade being arranged to lie within the area of the broad side 46), after which the carrier member is rotated to cause the blade to withdraw the carton from the stack (the gripper 48 and the movable stop 44 being moved clear in the meantime) against the action of the fixed stop 42. In this way, the stop 42 exerts a drag on the carton as it is moved by the blade with the result that the carton is partially opened during the movement of the blade 13, as indicated in Figure 5. During further movement of the blade, the carton is caused to engage a further fixed stop 54 in the form of a roller arranged to engage the narrow front side 43 to complete an opening of the carton into rectangular form as shown in Figure 5. On arrival at a withdrawing station after moving through 180° from the separating station, the blade is withdrawn and the carton forwarded (by means forming no part of this invention) to a carton filling and closing apparatus.

Each transfer blade is provided with a freely mounted roller 21 of the kind comprising inner and outer metal sleeves and an intermediate body portion of rubber. During translatory movement of the transfer blades 13, the rollers 21 are arranged to bear on the first and second guiding members in the form of arcuate guide rails 22 and 22A, respectively, the rail 22 serving to guide the rollers into successive arcuate guides 23 extending transversely from a chain 24 arranged for movement in directions parallel to the axis of the shaft 17, the guides 23 and chain 24 constituting the blade-inserting means, while the rails 22A serve to guide the rollers into successive arcuate guides 23A extending transversely from a similar chain 24A constituting with the guides 23A the blade-withdrawing means. The chains 24 and 24A are driven through bevel gearing 26 and 27 by a common Geneva mechanism 28.

The arcuate guides 23 and 23A extend transversely of the chains 24 and 24A, respectively, for a substantial distance so that the rollers 21 are caused to engage the guides 23 and 23A during translatory movement of the transfer blades 13 with the result that a substantial portion of the endwise movement of the transfer blades 13 is effected while the blades are translating about the axis of the shaft 17. The arcuate guide rails 22 and 22A are each formed with a spiral guiding surface 36 so as to cause the transfer blades 13 to commence their endwise movement before the rollers 21 engage the arcuate guides 23 and 23A, the inclination of the spiral surface 36 being such that, at the point of engagement of a roller 21 with the corresponding arcuate guides 23 and 23A, the vertical component of the velocity of the roller 21 is substantially equal to that of the arcuate guides 23 and 23A.

The Geneva mechanisms 18 and 28 are driven from a common crank wheel 29 which, in turn, is driven from a main shaft 31 through suitable gearing 32. The crank wheel 29 is arranged between the two Geneva wheels 18 and 19 and is provided with two sets of four rollers 38 and 39 extending, respectively, from opposite sides of the crank wheel 29, the rollers 38 being arranged to engage the slots of the Geneva wheel 18 and the rollers 39 the slots of the Geneva wheel 28. The Geneva wheel 28 is formed with four slots and the corresponding rollers 38 and 39 on the crank wheel 29 are so disposed in each case that as one roller leaves a slot in the Geneva wheel the next succeeding roller enters the next succeeding slot so that the period of rest is substantially instantaneous.

The Geneva mechanisms 18 and 28 are arranged out of phase with each other to such an extent that the arcuate guides 23 and 23A are approaching zero velocity as the carrier member is approaching maximum velocity. This arrangement is found to be very convenient for smooth entry and exit of the rollers 21 into and out of the guides 23 and 23A.

It will thus be seen that the transfer blades 13 commence their endwise movement before their rollers 21 enter the arcuate guides 23 and 23A, and that they continue their translatory movement during their endwise movement under the influence of the guides 23 and 23A, the transfer blades 13 reaching zero velocity during their passage through the guides 23 and 23A.

We claim:

1. In apparatus for feeding rectangular cartons of the type described from a pack in which the cartons are arranged in a flat collapsed condition one behind the other with the leading carton situated at a separating station, the combination of a carrier member mounted adjacent the separating station for movement about an axis parallel to the face of the pack, means for rotating said carrier member, a plurality of transfer blades slidably mounted on said carrier member in circumferential series at equal angu-

lar intervals for movement in endwise directions parallel to said axis, means for intermittently rotating said carrier member to bring each blade in turn to the separating station, blade-inserting means, means for intermittently moving said blade inserting means, said blade inserting means adapted while in motion to engage each blade in turn, during rotation of said carrier member, at a point substantially in advance of the separating station, means for coordinating the movement of the means for rotating said carrier member and said means for intermittently moving said blade inserting means so as to slide the blade in the endwise direction during movement of the carrier member and to insert it between the front and rear portions of the leading carton as the carrier member comes to rest at the separating station, a first guiding member for causing a preliminary endwise motion of each blade in turn as it approaches the moving blade-inserting means and for guiding the blade into engagement with the inserting means during such preliminary motion, intermittently movable blade-withdrawing means located at a subsequent station and adapted while in motion to engage the inserted blade during further rotation of said carrier member towards said subsequent station at a point substantially in advance of the subsequent station so as to slide it in the opposite direction during such further movement of the carrier member to effect its endwise withdrawal from the carton as the carrier member comes to rest at the subsequent station, and a second guiding member for causing a preliminary endwise withdrawing movement of the inserted blade as it approaches the moving blade-withdrawing means and for guiding the blade into engagement with the withdrawing means during such preliminary movement.

2. Apparatus for feeding rectangular cartons of the type described from a pack in which the cartons are arranged in a flat collapsed condition one behind the other with the leading carton situated at a separating station, the combination of a carrier member mounted adjacent the separating station for movement about an axis parallel to the face of the pack, means for rotating said carrier member, a plurality of transfer blades slidably mounted on said carrier member in circumferential series at equal angular intervals for movement in endwise directions parallel to said axis, means for intermittently rotating said carrier member to bring each blade in turn to the separating station, an endless chain, means for intermittently moving said chain in a plane parallel to the axis of the carrier member in timed relationship with the carrier member, a series of arcuate blade-inserting members attached to the chain at intervals and extending transversely of the chain, said blade-inserting members being adapted while in motion successively to engage the blades during rotation of said carrier member each at a point substantially in advance of the separating station, means for coordinating the movement of the means for rotating the carrier member and said means for intermittently moving said chain so as to slide the blade in the endwise direction during movement of the carrier member and to insert it between the front and rear portions

of the leading carton as the carrier member comes to rest at the separating station, a first guiding member for causing a preliminary endwise motion of each blade in turn as it approaches the blade-inserting member and for guiding the blade into engagement with that member during such preliminary motion, a second endless chain located at a subsequent station and intermittently movable in a plane parallel to the axis of the carrier member in timed relationship with the carrier member, a series of arcuate blade-withdrawing members attached to said second chain at intervals and extending transversely of the chain, said blade-withdrawing members being adapted while in motion successively to engage the blades during further rotation of said carrier member towards said subsequent station each at a point substantially in advance of the subsequent station, so as to slide it in the opposite direction during such further movement of the carrier member to effect its endwise withdrawal from the carton as the carrier member comes to rest at the subsequent station and a second guiding member for causing a preliminary endwise withdrawing movement of the inserted blade as it approaches the blade-withdrawing member and for guiding the blade into engagement with the withdrawing member during such preliminary movement.

3. Apparatus as in claim 2, wherein the first and second guiding members are constituted by a pair of fixed arcuate guide rails arranged circumferentially with respect to the axis of the carrier member so as to receive the blades from the inserting members and guide them into the withdrawing members and vice versa, said guide rails being formed with a spiral guiding path so as to cause the blades approaching the chains to commence their endwise movement before engagement with the arcuate blade-inserting and withdrawing members.

4. Apparatus as in claim 3, comprising freely mounted rollers on the transfer blades for engagement with the inserting and withdrawing members.

5. Apparatus as in claim 2, wherein the means for coordinating the movement of the means for rotating said carrier member and said means for intermittently moving said first chain comprise a pair of Geneva mechanisms for driving the carrier members and the endless chain, and a common crank wheel for driving the pair of Geneva mechanisms, said crank wheel having several rollers so disposed that as one roller leaves a slot in the Geneva wheel another engages the next succeeding slot so that the period of rest is substantially instantaneous.

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