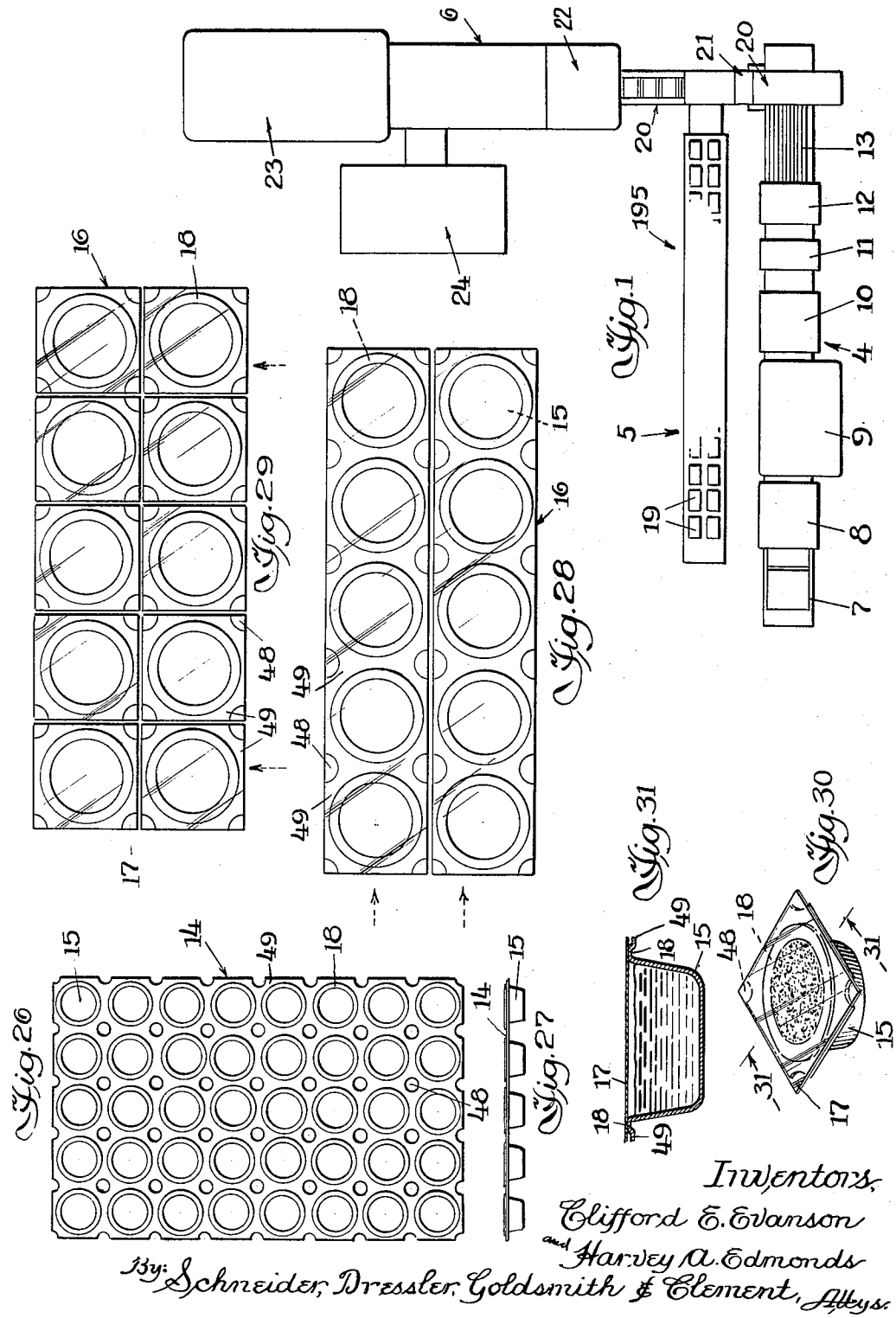
March 29, 1966 C. E. EVANSON ETAL 3,242,636

PACKAGING MACHINE

Original Filed April 7, 1961 13 Sheets-Sheet 1



Inventors,
Clifford E. Evanson
and Harvey A. Edmonds
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

Original Filed April 7, 1961 13 Sheets-Sheet 2

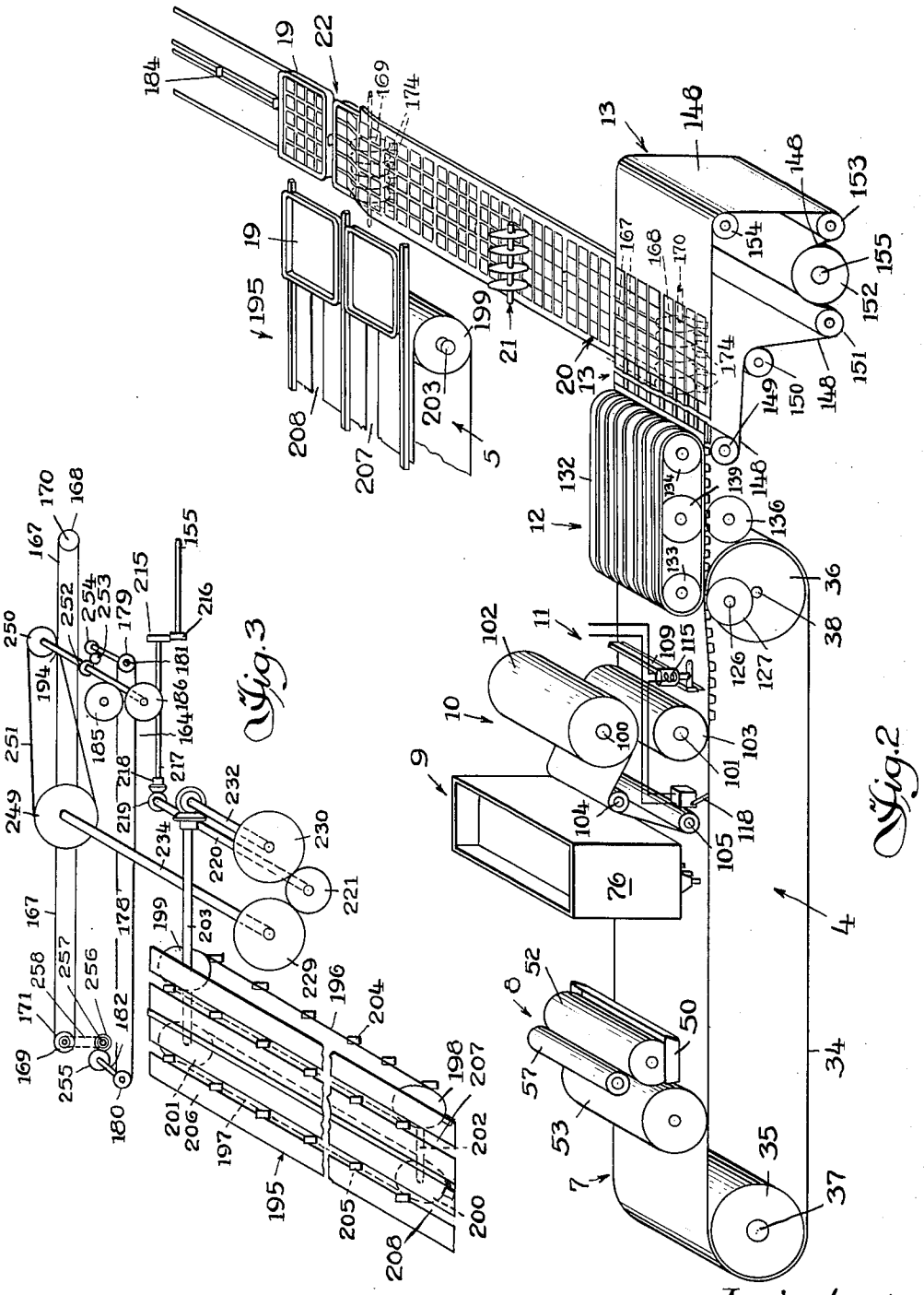


Fig. 2

Fig. 3

Inventors,
Clifford E. Evanson,
Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

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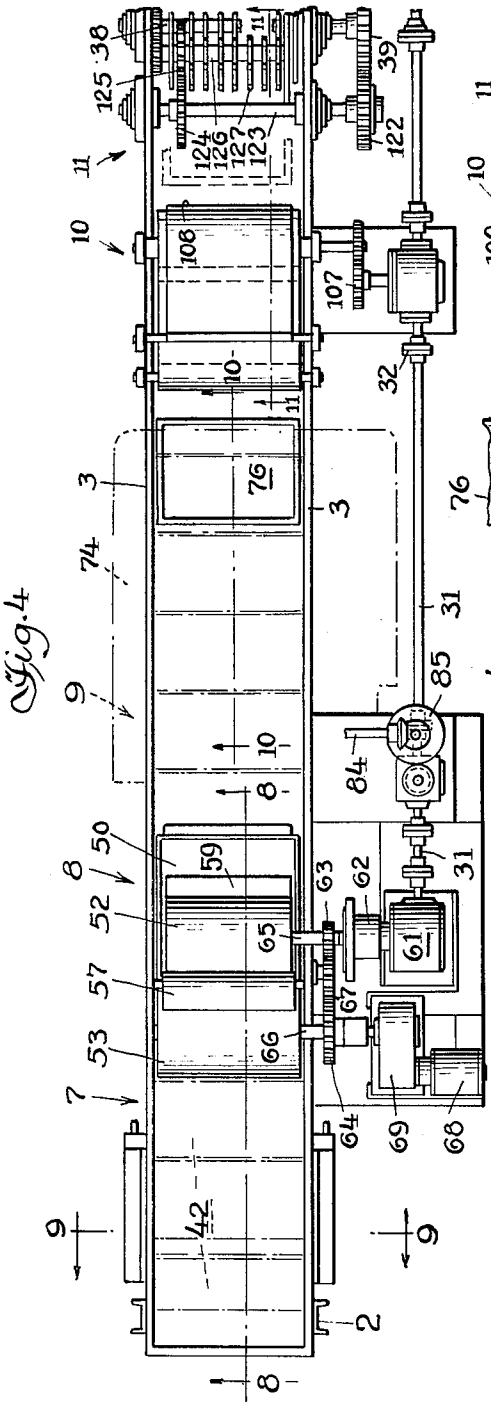


Fig. 4

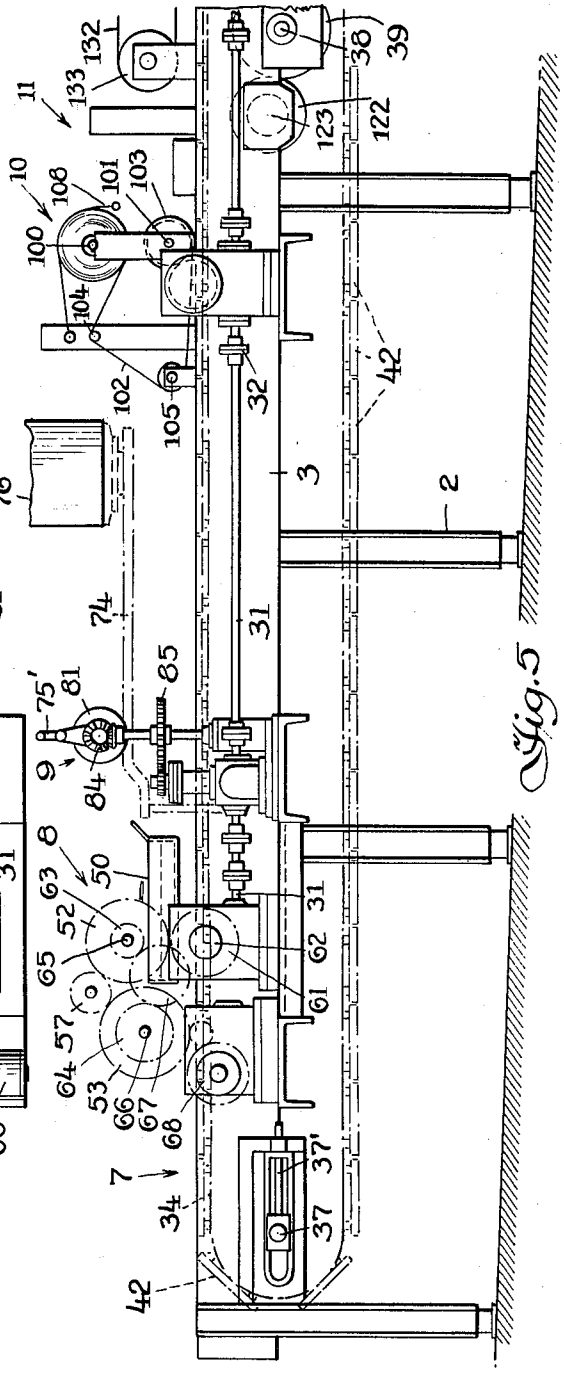


Fig. 5

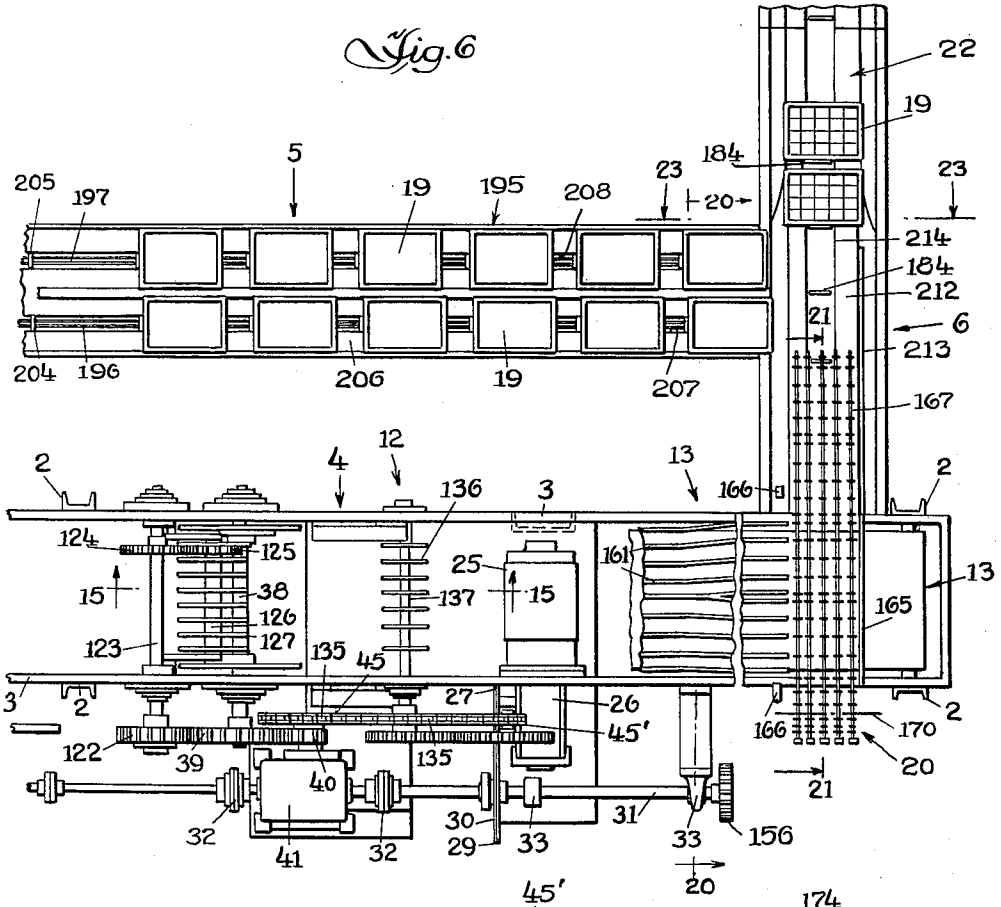
Inventors
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and
Harvey A. Edmonds,
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PACKAGING MACHINE

Original Filed April 7, 1961 13 Sheets-Sheet 4

Fig. 6



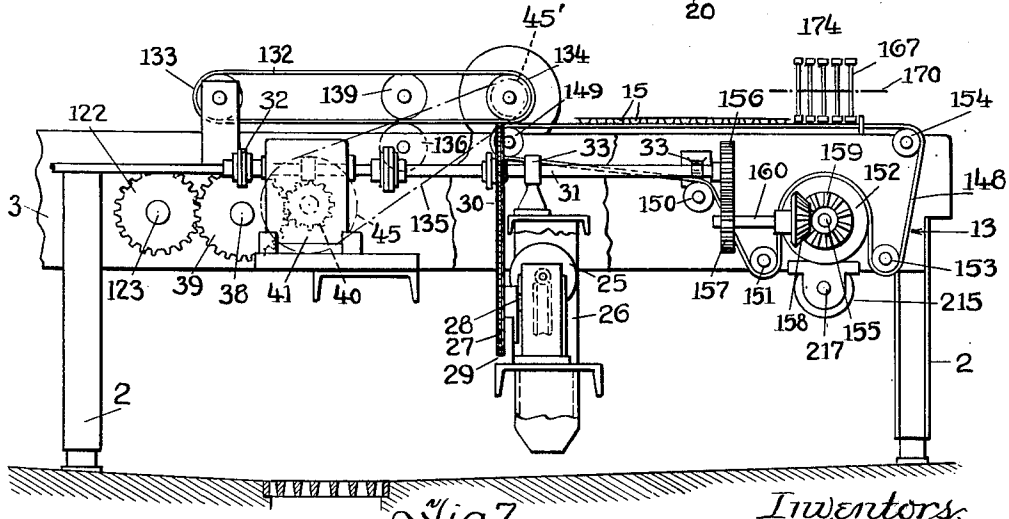


Fig. 7

Inventors,
Clifford E. Evanson
and
Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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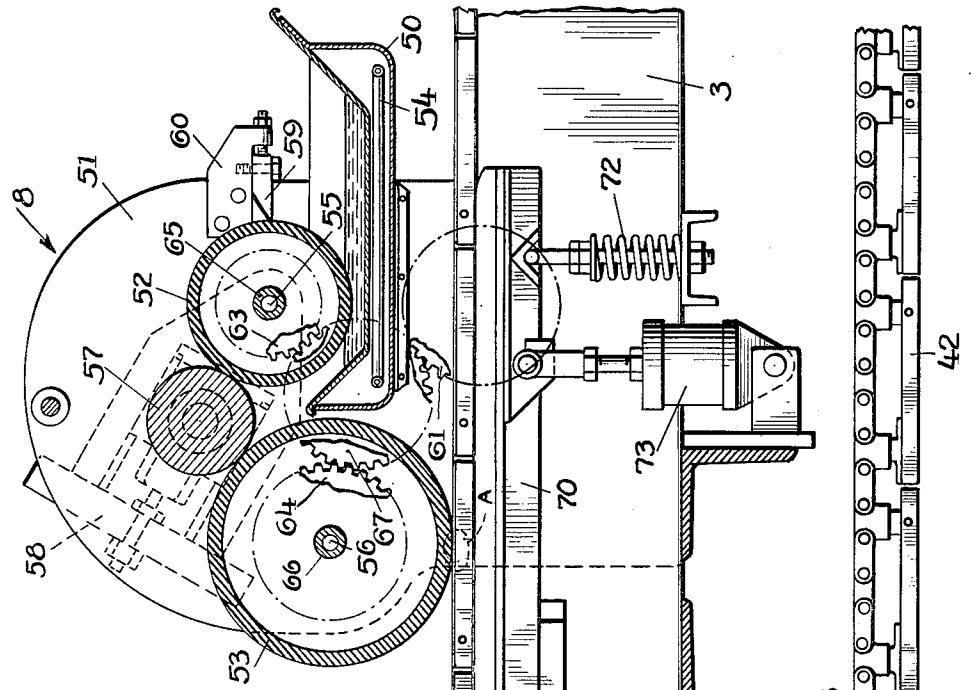


Fig. 8

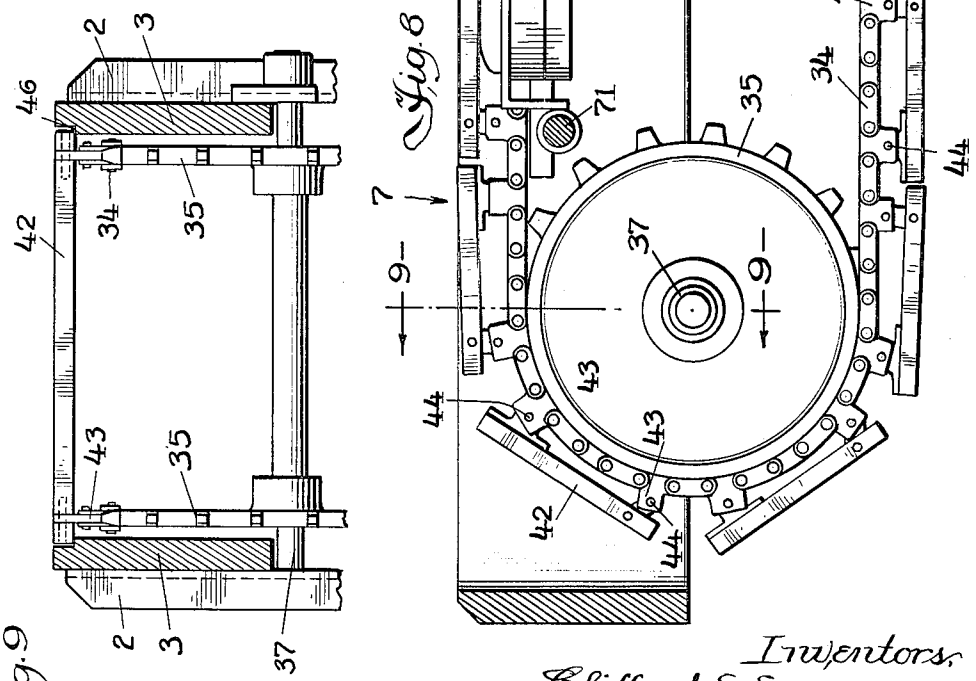


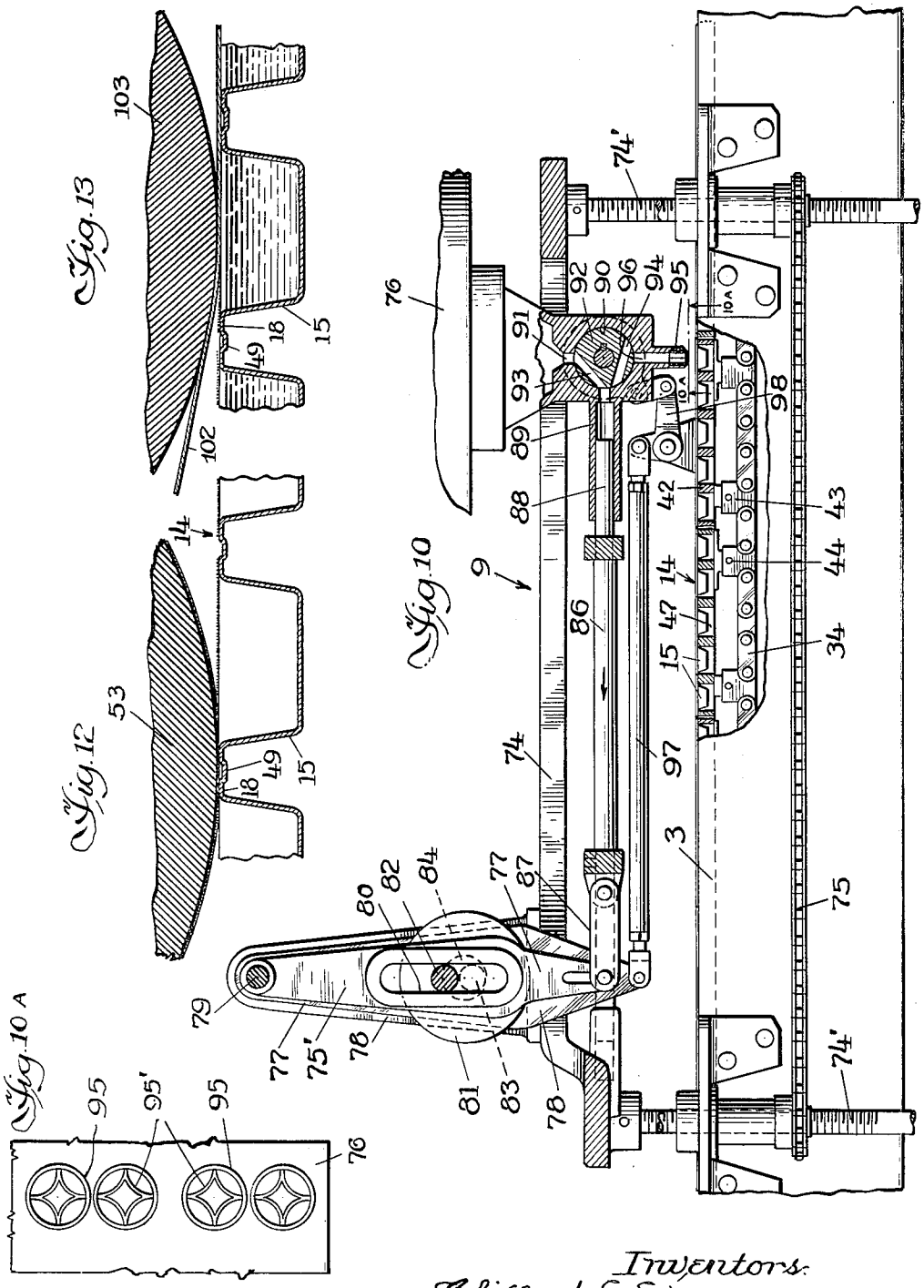
Fig. 9

Inventors,
Clifford E. Evanson
and
Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

Original Filed April 7, 1961 13 Sheets-Sheet 6



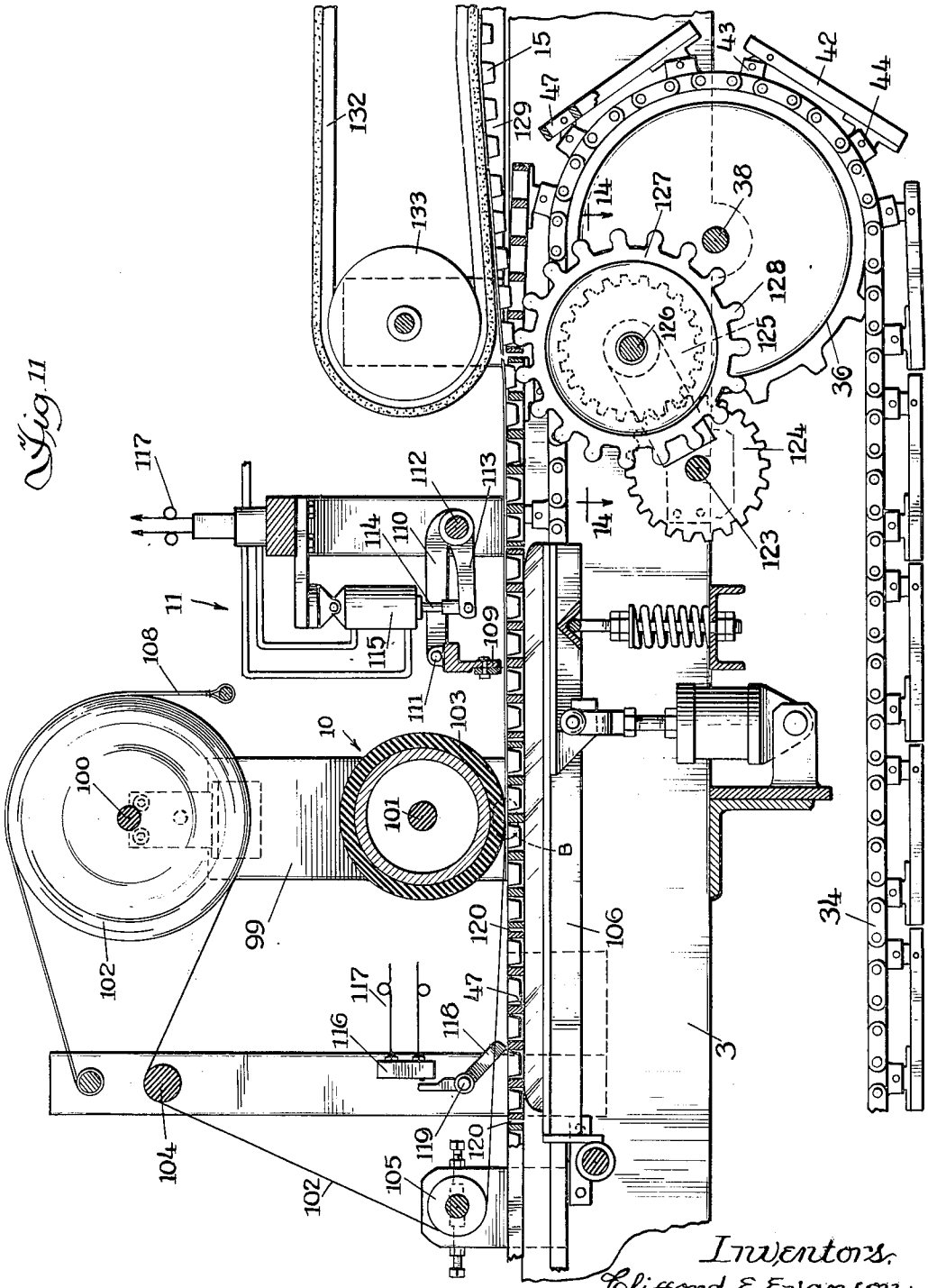
Inventors:
Clifford E. Evanson
and Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

Original Filed April 7, 1961 13 Sheets-Sheet 7

Fig. 11

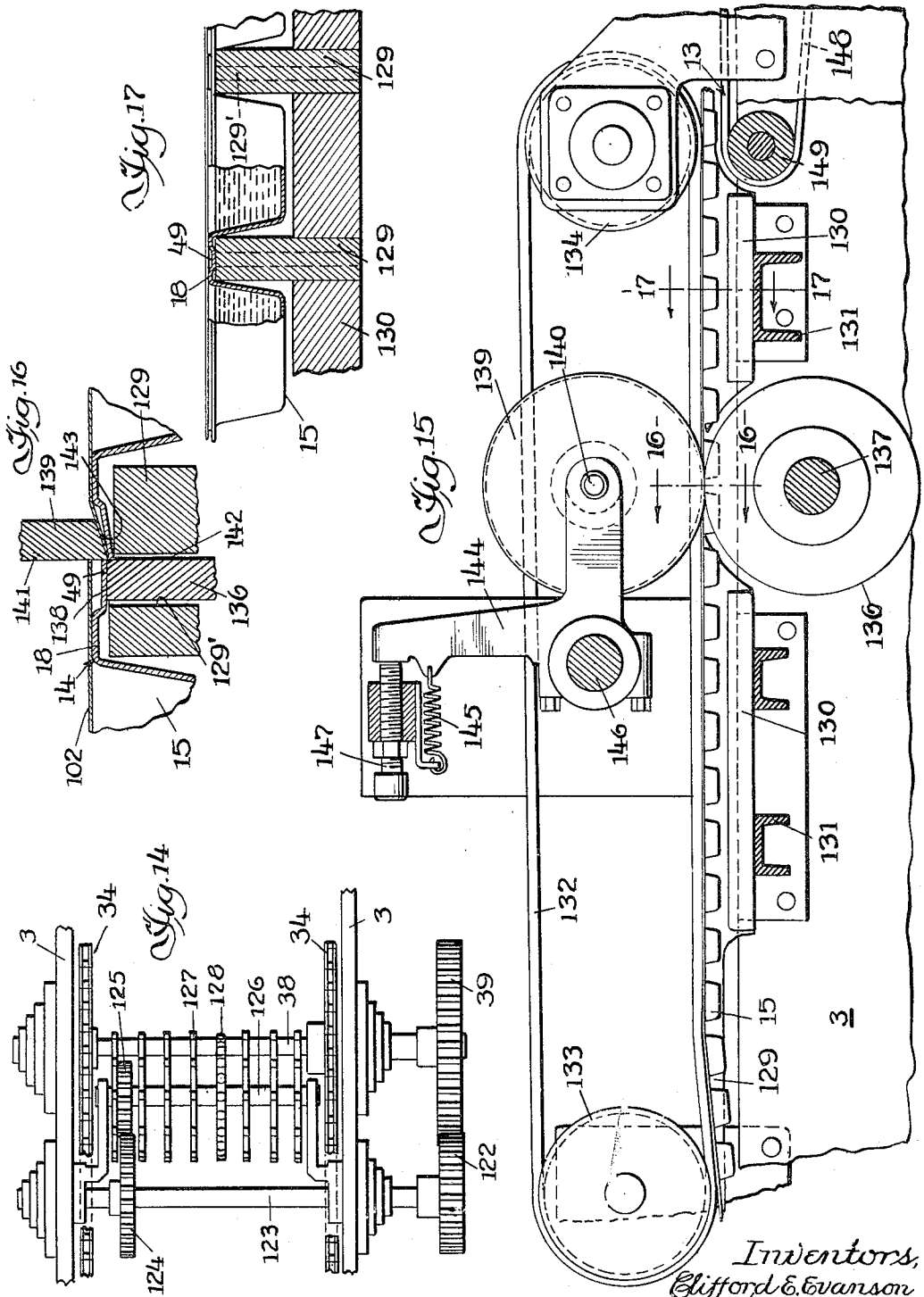


Inventors.
Clifford E. Evanson
and Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

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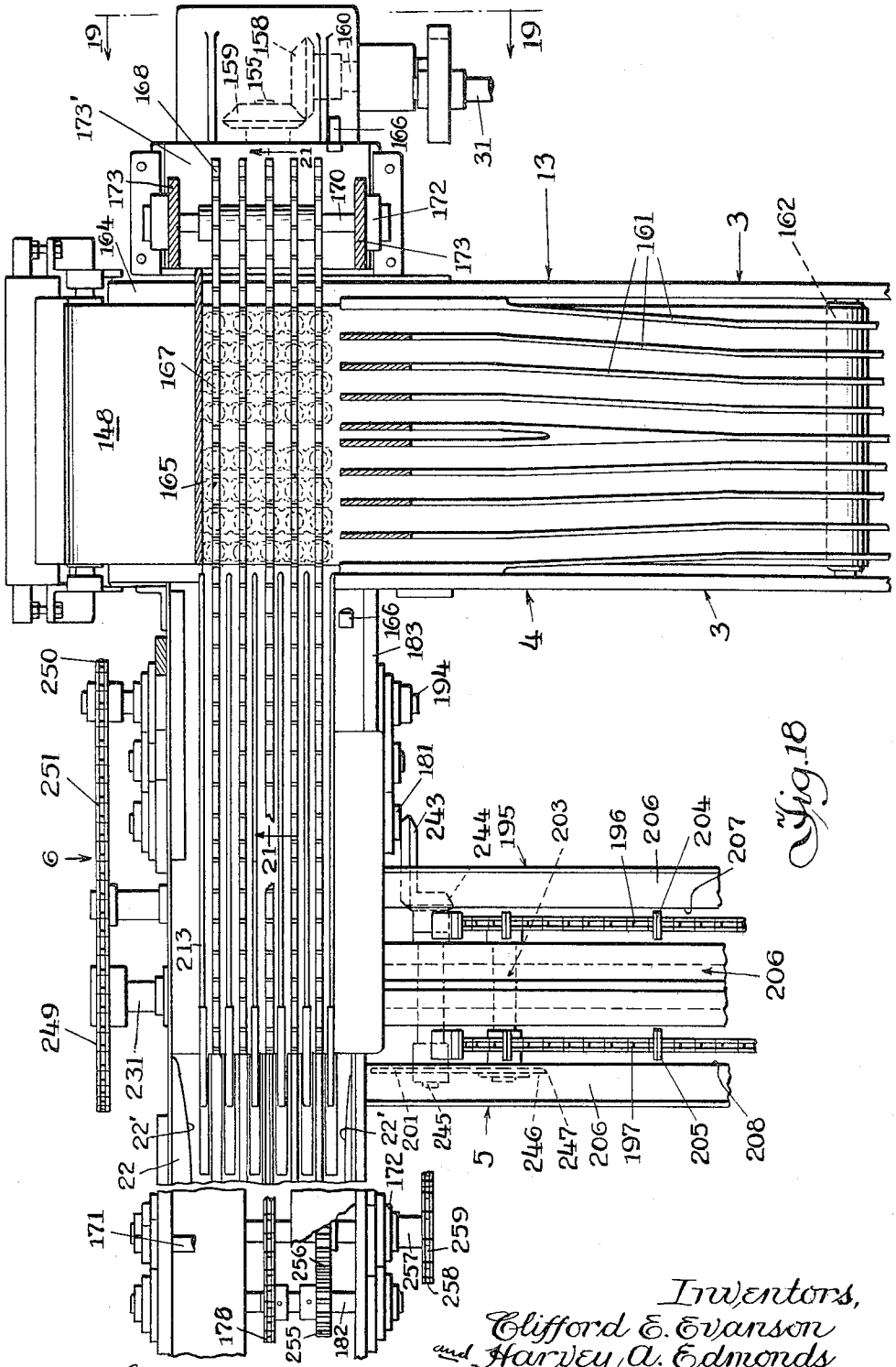


Fig. 18

Inventors,
Clifford E. Evanson
and Harvey A. Edmonds
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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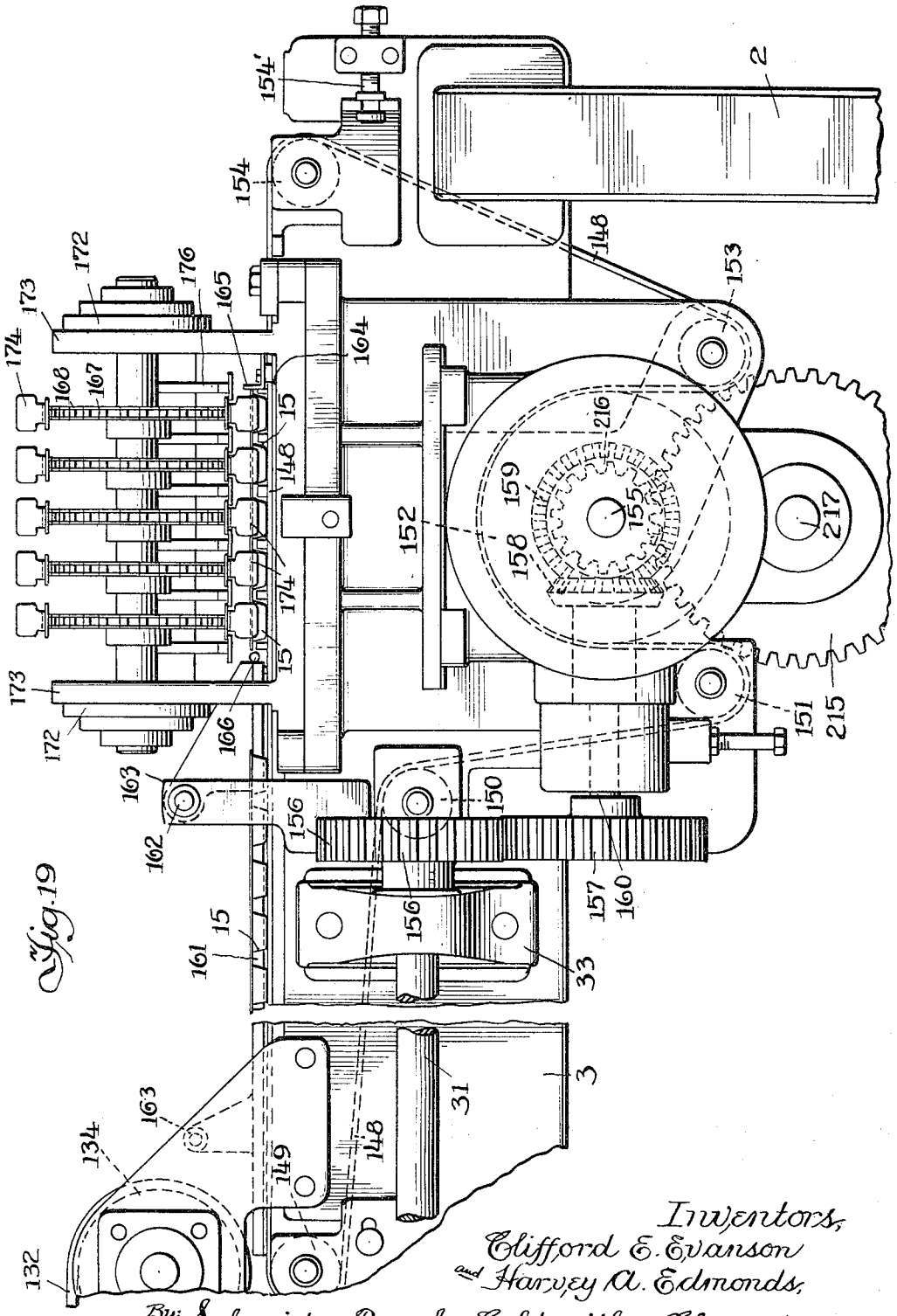


Fig. 19

Inventors,
Clifford E. Evanson
and Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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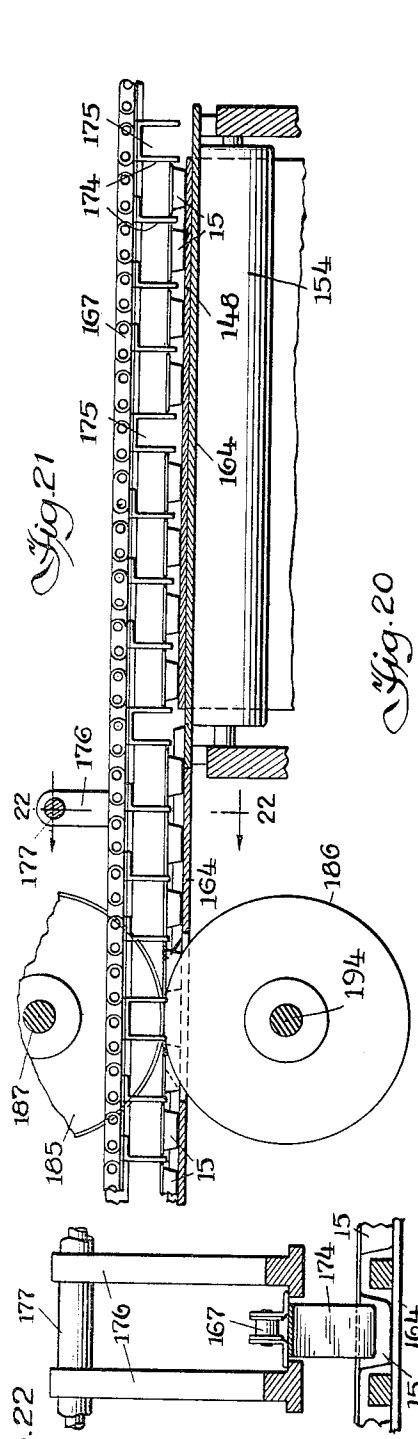


Fig. 21

Fig. 22

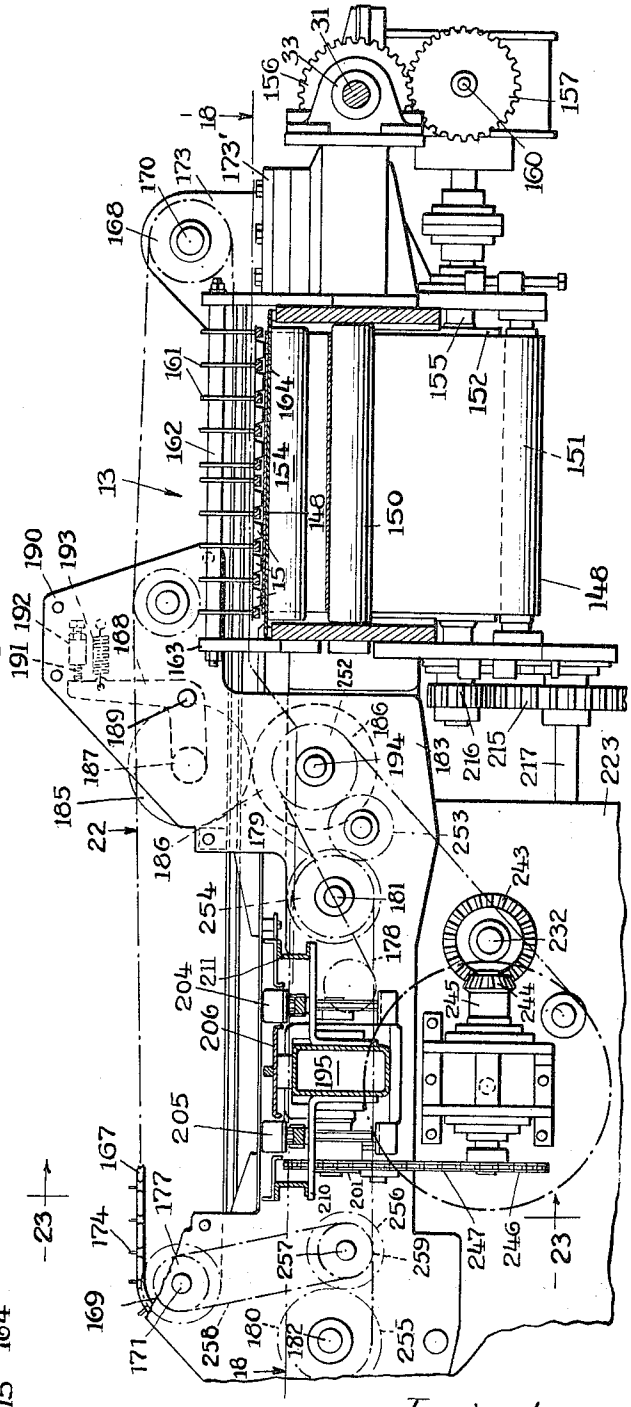


Fig. 20

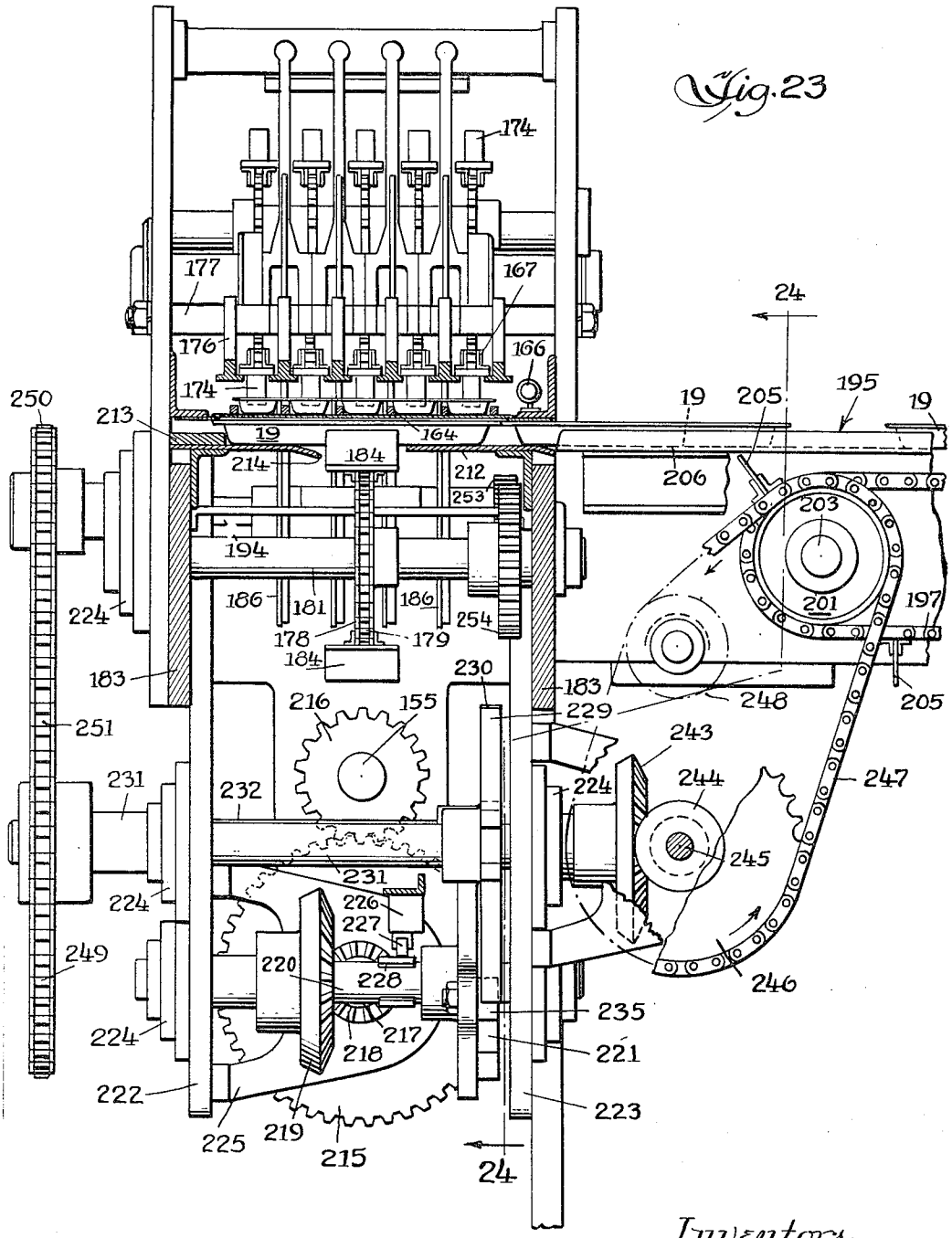
Inventors,
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and Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys.

March 29, 1966 C. E. EVANSON ETAL 3,242,636

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Fig. 23



Inventors.
Clifford E. Evanson
and Harvey A. Edmonds.
By: Schneider, Dressler, Goldsmith & Clement, Attys.

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PACKAGING MACHINE

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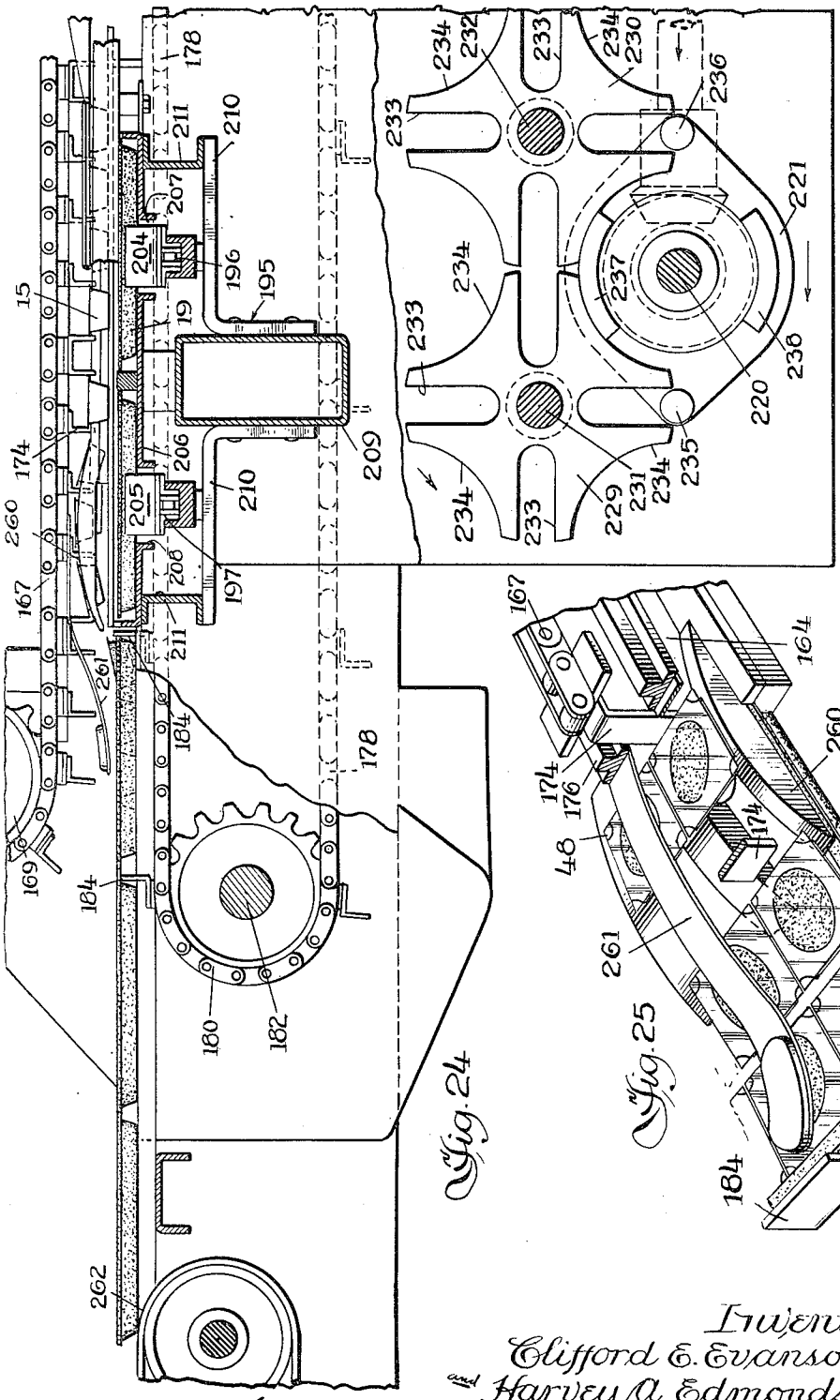


Fig. 24

Fig. 25

Inventors,
Clifford E. Evanson
and Harvey A. Edmonds,
By: Schneider, Dressler, Goldsmith & Clement, Attys

United States Patent Office 3,242,636 Patented Mar. 29, 1966

3,242,636

PACKAGING MACHINE

Clifford E. Evanson, Highland Park, and Harvey A. Edmonds, Chicago, Ill., assignors, by mesne assignments, to Continental Coffee Company, Chicago, Ill., a corporation of Illinois

Original application Apr. 7, 1961, Ser. No. 101,464. Divided and this application Feb. 18, 1965, Ser. No. 439,495

8 Claims. (Cl. 53—266)

This invention relates to a machine adapted to start with a supply of a material such as a condiment or medicine, for example, for packaging the same, and capable of forming completed, hygienically sealed packages thereof in one wholly contained and continuous operation.

This is a division of application Serial No. 101,464, filed April 7, 1961, now abandoned.

Although the machine will be hereinafter described with particular reference to packaging jelly, as an example of the product to be packaged, it will be understood that the advantages of the invention may be utilized in packaging a wide variety of foods and other products. The packaged materials are generally intended for individual servings, but the invention is not limited in this respect, nor is the invention limited to packaging products for human oral consumption.

Most of the commercial techniques and machines for making and filling individual serving packages have suffered serious drawbacks in that packages are processed individually, handled individually and pass through the machine one at a time.

In accordance with the present invention, a plurality of packages are handled together and remain together throughout their flow through the system to the stage where they are finally wrapped as a group. This permits the handling of a large number of packages in the same time that one package was handled heretofore.

There is described hereinbelow an illustrative embodiment of the invention in which forty packages move through the system together and are packed on twenty package trays that are over-wrapped, all as a continuous operation whereby the system begins with a sheet of individual, unseparated cup-like containers and concludes with a tray carrying individual containers, all of which are over-wrapped for ready and convenient cartoning for shipment. All of the operations are effected automatically so that labor operations are maintained at a minimum.

A packaging machine forming an illustrative embodiment of the present invention includes a conveyor provided with a series of plates apertured to receive a sheet of cups and mounted on an endless chain to travel in a continuous path. The plates are rectangular and the apertures are arranged in uniformly spaced rows to receive the cups formed in stiff plastic sheets, preferably of approximately the same size as the plates with the cups being shaped, sized and spaced to fit into the apertures in the plates. Conventional vacuum forming or embossing, or any other desired method, may be used for forming the cups in the plastic sheets.

The stiff plastic sheets in an exemplary arrangement have eight rows of cups with five cups in each row, it being understood, of course, that the sheets may be provided with any number of cups. The cups may be of any desired shape, such as oval or rectangular cross section; herein they are illustrated as circular in cross section. It is necessary, however, that the cups be arranged in rows aligned in right angle relationship so that slitters can divide each sheet into a plurality of individual cups of uniform size.

The packaging operation is started by placing a stiff plastic sheet with cups formed therein, on each of the plates. The plates, with the cups positioned within the apertures thereof, are then passed under a heated waxing roll.

The entire surface of the plastic sheet between the cups is coated with wax. If desired, each cup may be provided with a flat annular rim raised slightly above the plane of the sheet so that, as the sheet is passed under the heated waxing roll, wax may be applied only to the rim portion around each of the cups. The waxing roll is connected to the driving mechanism that drives the rest of the machine and is additionally connected to a separate motor capable of operation independently of the rest of the machine. The wax is continuously heated and agitated by the secondary drive for the waxing roll, even when the rest of the machine is temporarily shut down, as it is under certain operating conditions that will be hereinafter described. The wax is contained in a pan heated by hot oil that circulates in a closed system to keep the wax in melted condition. The hot oil is pumped from a heating tank to the pan, and is returned from the pan to the heating tank by gravity.

Each sheet of cups is moved by the plates of the first conveyor from the waxing roll, past a filling station, where the cups are filled in groups of eight at a time from a supply tank having a plurality of vertically disposed filling spouts. Preferably, two filling spouts are provided for each cup. The jelly is forced through the spouts by individual plungers reciprocably mounted in horizontally disposed cylinders. The spouts are connected to the horizontal cylinders by a rotary valve. A cam rotated by the main drive for the machine rotates to reciprocate the plungers in their horizontal plane. As soon as the leading edges of the first row of eight cups reaches a position under the filling spouts, the cam causes the plungers to start moving forwardly to force jelly from the horizontally disposed cylinders through the vertically disposed filling spouts into the individual cups. A second cam on the same shaft as the first mentioned cam rotates the valve to open the passages between each of the horizontally disposed cylinders and the filling spouts at the start of the forward movement of the plungers.

When the trailing edges of the cups reach the position under the filling spouts, the first mentioned cam reverses the movement of the plungers, and the second cam rotates the valves to a closed position to stop the flow of jelly. The same movement of the rotary valve that closes the passages between the cylinders and the spouts opens the passages between the cylinders and the supply tank. The lower ends of the filling spouts are divided into a plurality of small areas so that the surface tension holds the material against dripping. The rearward movement of the plungers sucks a metered quantity of jelly from the supply tank into each of the horizontally disposed cylinders. The first mentioned cam again reverses the plungers to move them forwardly, and the second cam rotates the valves to force a metered amount of jelly from each of said horizontally disposed cylinders into each of said cups as the leading edges of the next row of cups reaches the position under the filling spouts, and the cycle is repeated.

The forward movement of the plates carries the sheet of cups, now filled with jelly, under a roll which unwinds to apply a continuous thin sheet of plastic, such as polyethylene, to cover the top of the cups, and then under a heated roll which seals the thin sheet of plastic to the stiff plastic sheet throughout the waxed areas surrounding the individual cups. The rims of the cups may be raised slightly above the upper surface of stiff plastic sheet in which the cups are formed so that, if desired, the wax seal is substantially only between the cover sheet and the waxed, raised rim.

The plates then carry the sheet of integrally united, individual packages of jelly under a shearing knife that is operated by a solenoid controlled air valve to cut the cover sheet between adjacent cup sheets. The valve is actuated by a pivoted sensing arm connected to a switch. The free end of the sensing arm engages the top surface of the plate carrying the sheet of cups, and the switch is actuated on and off by the interengagement of the sensing arm with gaps between adjoining plates to actuate the solenoid and cause the knife to move downwardly to cut the continuous sheet of thin plastic between each of the plates. Each cover sheet is then substantially the same size as the sheet of cups which it covers.

Since the conveyor is moving continuously, the cover sheet moves forwardly as it is being cut. The knife mounting is pivoted at its upper edge so that the knife can swing slightly in the direction of the movement of the conveyor. As soon as the knife moves upwardly out of contact with the cover sheet, the mounting swings back to its normal position and the knife is in position to make the next cut.

After each sheet of jelly packages passes the knife, the sheet is engaged under its longitudinal edges by a pair of inclined rails that support it as it is transferred to a second conveyor aligned longitudinally with the first conveyor. A series of endless overhead belts engages the cover sheet and cooperates with the inclined rails to provide frictional contact that moves the sheets of jelly packages between upper and lower rows of parallel, vertically disposed, transversely arranged, coaxial, shear-type slitting disks. The upper and lower slitting disks are mounted on separate shafts and are rotated as the sheets of jelly packages pass between them. The lower slitting disks are positively driven, and the upper slitting disks are driven frictionally. The slitting disks slit the sheet longitudinally into eight strips, each having five integrally joined jelly packages.

The eight strips of jelly packages then move from the second conveyor onto a third conveyor that is aligned longitudinally with the first two conveyors, but is driven at a faster speed. The third, or speed-up conveyor, moves the strips in the same direction at increased speed to provide sufficient time for a transverse conveyor to move the strips of jelly packages formed from each sheet out of the way of the strips of jelly packages formed from the following sheet. The speed-up conveyor also cooperates with guides to divide the eight strips of packages formed from each sheet into two groups of four strips each, just before it moves them onto a stationary bed extending at right angles to the first three conveyors. A transversely extending strip or bar acts as a stop member to limit the longitudinal movement of the strips, and to align them for the transverse movement that is controlled by a double Geneva movement.

An "electric eye" system is positioned to project a beam of light parallel to the stop member and spaced therefrom a distance slightly greater than the length of each strip of five jelly packages. The system is controlled by a rotating cam that is rotated by the double Geneva movement mechanism and remains in its off position throughout most of the rotation of the cam, so that the strips of jelly packages can move past the beam onto the stationary bed without breaking the beam. Just before the cam reaches the point in its rotation at which the Geneva movement will start the movement of the first cross conveyor, it turns the electric eye system on for the indexing period of the Geneva movement.

If all eight strips of jelly packages are positioned on the stationary bed, with the forward end of each in engagement with the stop member while the beam is on, the beam is not broken, and the first cross conveyor starts moving the strips along the stationary bed transversely of their original direction.

If any one of the eight strips is not in its proper position for transverse movement on the stationary bed while

the beam is on, the beam is broken. Any interruption of the beam during the period it is on shuts down the entire machine, except for the waxing roll, which continues its rotation on its auxiliary motor to keep the wax agitated. When the strips of jelly packages are properly positioned, or removed from the machine in case of damage to the packages, after the machine has been shut down, the machine is started again by manual actuation of a starting switch, and the strips of jelly packages on the stationary bed are moved in the transverse direction.

The first cross conveyor comprises a series of five parallel endless chains mounted on pulleys positioned above the stationary bed. The lower reach of each chain is spaced above the stationary bed a distance slightly greater than the height of the cups. Each chain has a plurality of pusher plates projecting therefrom at right angles in alignment with the individual cups in each of the strips. Each pusher plate is long enough to reach the side wall of one of the cups without engaging the stationary bed. The pusher plates on each chain are spaced in groups of four, with adjacent groups on each chain spaced to conform to the spacing between the strips of jelly packages.

The movement of the first cross conveyor, which is controlled by the double Geneva movement, is intermittent. As previously stated, the eight strips of jelly packages slit from each sheet are divided into two groups of four strips each just prior to their movement into engagement with the transversely extending stop member that limits the longitudinal movement of the strips. Both groups of strips are then moved transversely and, as the last strip of the second group is moved transversely past the end of the stop member, the Geneva movement causes the first cross conveyor to stop momentarily to let the next two groups of strips be moved onto the stationary bed.

The pusher plates push the strips of jelly packages transversely under a cross slitter comprising four pairs of slitting disks which frictionally engage the strips between the rims of the cups and slit each strip into five individual jelly packages. Each jelly package is engaged by a pusher plate, and the slitting of the strips into individual packages does not affect the movement of the package on the first cross conveyor.

Both sets of slitters intersect the apertures that are spaced equally between the cups of each sheet. Accordingly, the second slitting operation provides each package with a notch in the form of a quarter-circle at each corner of the square in which the cup is located. The thin sheet of plastic which covers each cup is the same size as the square and its corners are not notched. Accordingly, its corners overlie the notches of the square so that the projecting portion of the thin plastic covering at any corner of the square may be lifted easily to uncover the cup. The notches at each corner of each square are not large enough to interfere with the sealing of the jelly package, but are large enough to provide the finger space required to lift the corner of the thin plastic sheet when the package is to be opened.

A tray conveyor, parallel to the first three conveyors, is also controlled by the double Geneva movement. Two rows of open top trays are moved in side-by-side relationship by the tray conveyor, and two trays are simultaneously moved onto a second cross conveyor under the stationary bed. The movement of the tray conveyor is intermittent, and is synchronized with the movement of the first cross conveyor by the double Geneva movement.

The second cross conveyor, aligned longitudinally with the first cross conveyor, is also controlled by the double Geneva movement. The second cross conveyor comprises an endless belt under the stationary bed, having individual pusher plates projecting upwardly therefrom. Each upwardly projecting pusher plate is adapted to engage one of said trays to move it parallel to the individual jelly packages at a slightly slower rate of speed. One

of the two trays is positioned under the individual packages cut from one group of four strips, and the other tray is positioned under the packages cut from the adjacent group of four strips. The two groups of strips are separated to allow space in conformity to the spacing between the depressed areas of two adjacent trays caused by the adjoining side walls of the trays.

As the individual jelly packages approach the end of the first cross conveyor, their rims engage downwardly curved surfaces, against which they are held by spring fingers. As the rims of individual cups are held down against the downwardly curved surfaces by the pressure of the spring fingers, the individual jelly packages are moved forwardly along said downwardly curved surfaces and into the trays by the first cross conveyor. The packages of each row of five packages are moved into the tray simultaneously. The spacing between adjacent rows of packages, caused by the insertion of a pusher plate behind each package, makes it necessary to move the packages slightly faster than the trays so that four rows of five packages each can be positioned in each tray without spaces between the packages.

The second cross conveyor moves the trays, each filled with twenty individual jelly packages, to an over-wrap unit that wraps each tray and its contents. The filled trays may be wrapped in a sheet of wax paper, transparent plastic, or any other suitable material. The wrapped trays are then carried by another conveyor, or by gravity, to a packing station where they are packed in cartons.

The foregoing advantages and numerous other features and advantages of the invention will be more readily understood and appreciated in the light of the following specification, taken in conjunction with the accompanying drawings, in which is shown an illustrative embodiment of this invention and in which:

FIGURE 1 is a diagrammatic top plan view of the jelly packaging machine embodying the invention;

FIG. 2 is a fragmentary diagrammatic perspective view of the machine;

FIG. 3 is a diagrammatic perspective view of the cross conveyor and tray feeding arrangement;

FIG. 4 is a fragmentary top plan view of one portion of the starting end of the machine, showing the first longitudinal conveyor;

FIG. 5 is a side elevational view of the mechanism shown in FIGURE 4;

FIG. 6 is a fragmentary top plan section comprising a continuation of the mechanism shown in FIGURE 4, and showing the tray conveyor and the cross conveyors;

FIG. 7 is a fragmentary side elevational view comprising a continuation of the mechanism shown in FIGURE 5;

FIG. 8 is an enlarged fragmentary longitudinal vertical sectional view, taken along the line **8—8** of FIGURE 4, and showing the waxing unit annd adjacent structure;

FIG. 9 is an enlarged fragmentary cross sectional view, taken along the line **9—9** of FIGURE 8;

FIG. 10 is an enlarged fragmentary longitudinal vertical sectional view, taken generally along the line **10—10** of FIGURE 4, and showing the filling unit and adjacent structure;

FIG. 10A is a fragmentary bottom plan view of the filling spouts, taken along the line **10A—10A** of FIGURE 10, and showing the inserts for dividing the flow of jelly;

FIG. 11 is an enlarged fragmentary longitudinal vertical sectional view, taken along the line **11—11** of FIGURE 4, and showing the sealing unit, the shearing unit and adjacent structure;

FIG. 12 is an enlarged fragmentary longitudinal vertical sectional view of the structure located in the area of circle A in FIGURE 8;

FIG. 13 is an enlarged fragmentary longitudinal sectional view of the structure located in the area of circle B in FIGURE 11;

FIG. 14 is an enlarged fragmentary top plan view, taken along the line **14—14** of FIGURE 11;

FIG. 15 is an enlarged fragmentary longitudinal vertical sectional view, taken along the line **15—15** of FIGURE 6, and showing the longitudinal slitting unit and adjacent structure;

FIG. 16 is an enlarged fragmentary cross sectional view, taken along the line **16—16** of FIGURE 15;

FIG. 17 is an enlarged fragmentary cross sectional view, taken along the line **17—17** of FIGURE 15;

FIG. 18 is a fragmentary top plan sectional view of one corner of the machine, taken along the line **18—18** of FIGURE 20, and showing the cross conveyor mechanism and the ends of the parallel longitudinal conveyors adjacent thereto;

FIG. 19 is an enlarged fragmentary and elevational view, taken along the line **19—19** of FIGURE 18;

FIG. 20 is a longitudinal vertical sectional view, taken along the line **20—20** of FIGURE 6;

FIG. 21 is a longitudinal vertical sectional view, taken along the line **21—21** of FIGURES 6 and 18;

FIG. 22 is an enlarged fragmentary cross sectional view, taken along the line **22—22** of FIGURE 21;

FIG. 23 is an enlarged fragmentary vertical sectional view, taken along the line **23—23** of FIGURES 6 and 20;

FIG. 24 is a fragmentary longitudinal sectional view, taken generally along the line **24—24** of FIGURE 23;

FIG. 25 is an enlarged fragmentary perspective view of the hold-down mechanism for guiding the individual jelly packages into the tray;

FIG. 26 is a top plan view of a plastic sheet having a plurality of cups embossed therein;

FIG. 27 is an end view of the sheet shown in FIGURE 26;

FIG. 28 is a top plan view, showing two strips of integrally joined individual jelly packages formed by the initial slitting operation on the sheet of FIGURE 26;

FIG. 29 is a top plan view, showing the individual packages separated from each other by slitting the strip of packages shown in FIGURE 28;

FIG. 30 is a detail perspective view of one of the individual jelly packages; and

FIG. 31 is a cross sectional view, taken along the line **31—31** of FIGURE 30.

Referring to the drawings, and particularly to FIGURES 1 and 5 thereof, the frame of the machine comprises a plurality of upright standards **2** and side plates **3**. The frame is not a single unit, but is built up to provide two parallel longitudinal sections, designated generally by reference numerals **4** and **5**, and a transverse section **6** extending across corresponding ends of the longitudinal sections. Longitudinal section **4** comprises a first conveyor unit **7**, a waxing unit **8**, a filling unit **9**, a sealing unit **10**, a cover shearing unit **11**, a slitting unit **12**, and a speed-up conveyor unit **13**.

Rectangular sheets **14** of stiff plastic, having a plurality of rows of cups **15** formed therein, are manually placed on conveyor unit **7**. The cups are filled with jelly and sealed while moving along on conveyor unit **7**, and are delivered to the transverse section **6** in the form of strips **16**, each comprising five cups filled with jelly, each cup being covered by a strip cut from a thin, preferably transparent, sheet **17** of plastic that is sealed to the upper surface of the sheet **14** between the cups. The sheets **14** may be provided with rims **18** raised slightly above the surface of the plastic sheet in which the cups are formed. In such cases, the sheet **17** would be sealed only to the raised rims **18**.

Longitudinal section **5** is a conveyor adapted to deliver two open top trays **19** simultaneously to transverse section **6** in synchronization with the movement of the jelly pack-

ages along said transverse section. Trays 19 are automatically positioned so that each pair of trays receives the cups formed from a single sheet 14. The cups are filled and sealed before they are positioned in the trays.

The transverse section 6 comprises a first cross conveyor 20, a cross slitting unit 21, a second cross conveyor 22, an overwrap unit 23 and a packing station 24. The cross slitting unit 21 slits the strips 16, each of which comprises 5 jelly packages, to divide each strip into individual jelly packages. A double Geneva movement, hereinafter described, synchronizes the conveyor 5 and the cross conveyors so that the trays and the individual jelly packages reach the cross conveyor 22 at the same time. The jelly packages are fed at a slightly faster rate of speed than the trays, to make up for the space taken up by the pushers, and each tray is filled with twenty individual packages of jelly. The filled trays are carried by the conveyor 22 to the overwrap unit 23.

The overwrap unit comprises a conventional mechanism for wrapping each tray with a thin wrapper, such as wax paper, cellophane, or any other suitable material. The wrapped trays are then delivered automatically to the packing station 24 where they are packed into cartons or boxes for shipment.

The drive mechanism for the longitudinal section 4, shown in FIGURES 4, 5, 6 and 7, provides a continuous operation for each of the units in said section. The drive mechanism is powered by a motor 25 and reduction gear 26 mounted on the frame of the machine. A sprocket gear 27 mounted on the shaft 28 drives a chain 29 that extends around another sprocket gear 30 mounted on a shaft 31. Shaft 31 extends substantially along the entire length of the longitudinal section 4 and is operatively connected to various units as hereinafter described. The shaft 31 is provided with couplings 32 wherever desired, and with suitable bearings 33.

The first conveyor unit 7, shown in FIGURES 4–8 and 11, comprises an endless chain 34 extending around sprocket gears 35 and 36 mounted on shafts 37 and 38, respectively. Shaft 37 is provided with conventional tensioning means, indicated at 37', FIGURE 5. A gear 39 mounted on shaft 38 is driven by a gear 40 operatively connected to shaft 31 through a gear box 41. A plurality of flat rectangular plates 42 are secured to lugs 43 projecting from chain 34. Each plate is pivotally connected adjacent each corner thereof to lugs 43, as indicated at 44. As shown in FIGURE 9, side plates 3, secured to standards 2 in any suitable manner, are each provided with an internal shoulder 46 for supporting the edges of plates 42 in their travel along the upper reach of chain 34 between sprocket 35 and the waxing unit 8, and also between the sealing unit 10 and the sprocket 36.

Plates 42 are each provided with a plurality of rows of apertures 47 arranged at right angles and spaced uniformly throughout the area of the plate. Apertures 47 are illustrated as being cylindrical, but may be of any desired shape. The apertures 47 extend entirely through the plate 42 to provide openings in the bottom of plate 42, for a reason hereinafter disclosed.

Sheet 14 is preferably of approximately the same size as the plates 42, but smaller sheets may be used, if desired. The cups 15 formed in the stiff plastic sheet are spaced in conformity with the spacing between the apertures 47. Each cup is dimensioned to fit easily into the apertures 47. The side walls of the cups are preferably tapered somewhat, to facilitate insertion and removal of the cups into and out of the apertures. Sheet 14 is provided with a plurality of small apertures 48 that are spaced uniformly between the cups. Apertures 48 are shown as being circular, but they may be of any desired shape. The portions of sheet 14 contiguous to the upper edges of the cups 15 may be raised slightly above the upper surface of the sheet to form a flat annular rim 18 surrounding each cup. The rims 18 of adjoining cups, when provided, are spaced from each other to provide a flat surface 49 therebetween wide enough to allow slitters, hereinafter described, to slit the sheet without deforming any of the cups.

As shown in FIGURES 4, 5 and 8, the waxing unit 8 comprises a pan 50 suitably mounted between two side frame members 51 projecting upwardly above the chain 34. The side frame members 51 also support rollers 52 and 53 that are journaled in suitable bearings mounted on said frame members. Roller 52 is partially immersed in melted wax, such as paraffin, contained in pan 50. Roller 53 is mounted in peripheral engagement with the upper surface of sheet 14 or with the raised rims 18 of cups 15 positioned in plates 42 passing below roller 53 as they are being moved toward the jelly filling unit. The pan 50 and rollers 52 and 53 are heated in any suitable manner, as, for example, by means of hot oil circulating through tubular conduits 54, 55 and 56 to keep the wax in melted condition. A satisfactory circulatory system, which is not shown in the drawings, may comprise an oil tank, means for heating the oil in said tank, and a pump for pumping the heated oil through the conduits. The oil may flow back into the tank by gravity. The continuous rotation of roller 52 keeps the melted wax agitated so that the heat is distributed evenly throughout the wax.

Roller 53 is spaced from roller 52, and an idler roll 57, rotatably mounted in a frame 58, is pressed against the peripheral surfaces of rollers 52 and 53 to transfer melted wax from the peripheral surface of roller 52 to the peripheral surface of roller 53. A doctor blade 59, mounted in a frame 60 supported on the frame members 51, engages the peripheral surface of roller 52 to prevent an excessive amount of the melted wax from passing on to the surface of roll 57.

The roller 52 is driven by shaft 31 through a gear box 61 and an overrunning clutch 62. Gears 63 and 64, mounted, respectively, on shafts 65 and 66 of rollers 52 and 53, are interconnected by an idler gear 67. A separate motor 68, independent of shaft 31, is connected to shaft 66 through a reduction gear 69. The purpose of motor 68 is to agitate the melted wax when the rest of the packaging machine is temporarily stopped. After the machine has been out of operation for any considerable length of time, such as overnight, for example, the motor 68 may be energized to rotate roller 52, and thereby agitate the wax so that it is in proper operating condition, before the entire machine is put into operation. At the start of the regular machine operation, motor 68 may be turned off.

Under certain conditions, hereinafter described, the operation of the machine may be temporarily stopped. If the motor 68 is manually controlled, it is necessary to start it in order to keep the wax in proper operating condition. However, in addition to the manually operable switch, the motor 68 may have an automatic control so that it is turned on automatically if the machine is turned off, and is turned off automatically when the machine is turned on.

As previously mentioned, roller 53 is in peripheral engagement with the upper surface of sheet 14 or with the rims 18 of the cups 15 as they pass beneath said roller. Arms 70, pivotally mounted adjacent opposite sides of the frame, as indicated at 71, are pressed upwardly against the longitudinal edge portions of plates 42, by means of springs 72, to insure a firm contact between roller 53 and sheet 14 or rims 18. The firm contact between roller 53 and the sheet 14 or rims 18 insures that the sheet 14 will receive a thin coating of wax around each cup as the sheet 14 passes under the roller 53.

It is sometimes necessary to release the pressure of the plate 42 against roller 53 either for maintenance purposes, or to prevent the roller 53 from rubbing against the plate 42 when the operation of the machine is stopped and rollers 52 and 53 continue rotating to keep the melted wax agitated. An air cylinder 73, mounted on the frame in any suitable manner, is connected to the end of arm 70

adjacent spring 72 and automatically pulls the arm 70 downwardly about its pivot 71, against the action of spring 72, far enough to relieve the pressure contact of plates 42 against roller 53 when the operation of the machine is stopped. As soon as the machine resumes operation, the air cylinder is rleased automatically to allow the spring 72 to move the arm 70 back into frictional contact with the sheets 14.

After the waxing unit 8 has applied a thin coating of melted wax to the sheets 14, the continuous movement of conveyor unit 7 carries each sheet 14 under the filling unit 9, shown in FIGURES 4, 5, 10 and 10A. The filling unit comprises a supporting frame 74, mounted on four screw jacks 74' projecting above side plate 3. A chain 75 extends around sprockets on each of the jacks so that rotation of one jack turns all four jacks to raise or lower all four corners of the frame 74 simultaneously. The frame 74 supports a pair of upstanding standards 75' and a supply tank 76 containing jelly or other material to be packaged. A plurality of rocker arms 77 and a rocker arm 78 are pivotally supported at their upper ends by a rod 79 mounted on the upper ends of standards 75'. Each rocker arm is provided with a vertically elongated slot, such as the slot 80 intermediate the length of rocker arm 77. A flat disk 81 positioned between rocker arm 78 and the adjacent rocker arm 77 is provided with an eccentric pin 82 projecting laterally from one side thereof and extending through the slots 80 in all of the rocker arms 77. The disk 81 is provided with another eccentric pin 83 projecting from its other side through the corresponding slot (not shown) of rocker arm 78. Disk 81 is keyed to a transverse shaft 84 that is driven by shaft 31 through gearing 85. As the shaft 84 is rotated, the arms 77 and 78 are rocked about their pivot 79.

A horizontally disposed rod 86 is connected to the lower end of each rocker arm 77 by a short link 87 that causes each rod 86 to be reciprocated in a horizontal plane as the rocker arms 77 are rocked about their pivot 79. Two plungers 88 are connected to each rod 86 and fit into individual, horizontally disposed cylinders 89 that project laterally from the lower portion of supply tank 76. Each cylinder 89 communicates with a cylindrical opening 90 in the lower portion of tank 76. The opening 90 also communicates with the interior of tank 76 by a passageway 91. A rotary valve 92 fitting in opening 90 is provided with two separate bores 93 and 94. A plurality of filling spouts 95 projecting from the bottom of tank 76 communicate with opening 90 through a passageway 96.

Preferably, two filling spouts are provided for each cup. Each filling spout has a sheet metal insert 95' secured in its lower end. The inserts are tubular and are shaped to divide the cross sectional area of each spout into five parts to cause five small streams of jelly to flow from each spout when the cups are being filled. The multiplicity of openings facilitates rapid filling of the cups, and also prevents any dripping. The cross sectional area of each of the five openings is so small that as soon as the rotary valve 92 is turned to cut off the flow of jelly into the spouts, the jelly that is in each spout below the valve is held against dripping by surface tension.

When valve 92 is oscillated so that one end of bore 93 is aligned with passageway 91, the other end of the bore 93 is aligned with cylinder 89 to form a free flow passage for the jelly between tank 76 and each of the cylinders 89. In said valve position, the bore 94 is closed at both ends. When the valve 92 is oscillated to move one end of the bore 94 into alignment with cylinder 89 the other end of the bore 94 is aligned with filling spout 95 and both ends of bore 93 are closed.

A horizontally disposed rod 97 is connected at one end to the lower end of rocker arm 78 and at its other end to a linkage 98. The other end of linkage 98 is operatively connected to valve 92 in such a manner that reciprocation of rod 97 oscillates valve 92 to alternately align passageways 93 with cylinders 89 and passageways 91, and passageways 94 with cylinders 89 and passageways 96.

The rocker arms 77 and 78, rods 86 and 97, and drive shaft 31 are interrelated to synchronize the movement of sheets 14 longitudinally of the machine with the oscillation of the valve 92. During the time conveyor 7 is moving the portion of sheet 14 between the trailing edge of one row of cups 15 and the leading edge of the next row of cups under the filling spouts 95, the passageways 93 are aligned with passageways 91 and the cylinders 89. At this time, the plungers 88 are being pulled outwardly of their respective cylinders 89 to such a metered quantity of jelly into each cylinder. When the leading edge of the next row of cups is moved under the filling spouts 95, the direction of movement of rods 86 is reversed to push plungers inwardly of their respective cylinders. At the same time rod 97 oscillates valve 92 to align passageways 94 with cylinders 89 and passageways 96. Accordingly, each plunger 88 forces the metered quantity of jelly from its cylinder through its filling spouts 95 and into the cup then positioned below and in alignment with said filling spouts. Rods 86 and 97 are again reversed as the trailing edge of the filled cups are moved past the filling spouts toward the sealing unit 10.

The sealing unit, as shown in FIGURES 4, 5 and 11, comprises a pair of upstanding standards 99 at opposite edges of the machine frame to support an upper shaft 100 and a lower shaft 101. A supply roll of thin transparent plastic sheet material 102, of the same width as the sheet 14, is rotatably mounted on shaft 100. A heated pressure roll 103 is rotatably mounted on shaft 101 with its peripheral surface in engagement with the upper surface of the sheets 14 of cups carried past said roller by the conveyor 7. The sheet material 102 extends around idler rolls 104 and 105 and then between roll 103 and the upper surface of plates 42. The sealing unit is provided with pressure arm 106, which are duplicates of pressure arms 70, for pressing the plates 42 upwardly against the heated pressure roll 103.

The pressure roll shaft 101 is driven by shaft 31 through gearing 107. The sheet 102 is pulled from the supply roll by the frictional contact between roll 103 and sheets 14 carried by plates 42 under said roll. A friction drag 108 hanging over the top of the supply roll keeps the sheet 102 from unwinding too fast. As the sheet 102 is moved under roll 103 it is adhered to the sheets 14 by heat and pressure. The sheet 102 covers all of the cups 15 and the apertures 48 in each sheet 14.

The shearing unit 11, positioned adjacent the sealing unit, includes a transversely disposed knife 109 pivotally mounted on an arm 110, as indicated at 111. The other end of arm 110 is pivoted on a stud 112 and is rigidly secured to one end of a third arm 113 that is pivoted at its other end to the plunger 114 of a solenoid 115. The solenoid is actuated by a switch 116 connected thereto by wiring 117. The switch 116 is closed by a sensing arm 118 having its lower end engaging the upper surface of the edge portion of plates 42. Arm 118 is pivoted adjacent switch 116, as indicated at 119, so that its upper end is spaced from the switch when its lower end is in engagement with the upper surface of plate 42. A transverse gap 120 extends between the trailing edge of each plate 42 and the leading edge of the adjacent plate. As each of these gaps pass the lower end of sensing arm 118, the sensing arm drops into the gap, and its upper end closes the switch 116 to actuate the solenoid 115. The sensing arm may drop into the gap by gravity or may, if desired, be spring pressed. The closing action of the switch is instantaneous, and the upper end of the sensing arm is moved out of engagement with the switch as soon as the gap 120 moves past the lower end of said sensing arm.

The knife drops to shear sheet 102 upon actuation of the solenoid. The sensing arm, solenoid and knife are so arranged that when the knife drops it moves into one of

the gaps 120. Since the movement of chain 34 is continuous, the plates 42 move slightly before the de-energization of the solenoid lifts the knife out of the gap 120, even though the shearing action is practically instantaneous. The pivotal connection 111 permits the knife 109 to swing in the longitudinal direction of the machine far enough so that its mounting is not distorted or broken before the knife is lifted out of the gap. The mounting of knife 109 is spring pressed so that it moves back to its normal vertical position as soon as the knife is lifted out of the gap 120.

Referring to FIGURES 4, 11, 14 and 17, the gear 39, mounted on shaft 38, is meshed with a gear 122 to rotate a shaft 123, on which gear 122 is mounted. Another gear 124, also mounted on shaft 123, meshes with a gear 125 to drive a transverse shaft 126 rotatably mounted between shafts 123 and 38. A plurality of cog wheels 127 fixed to shaft 126 and spaced transversely to conform to the transverse spacing of the cups 15 have laterally projecting cogs 128 spaced circumferentially thereof to conform to the longitudinal spacing between cups 15. The outer ends of cogs 128 are dimensioned to be received within apertures 47 in the plates 42. As each plate 42 approaches the end of conveyor 7, cogs 128 enter the apertures 47 and push against the bottoms of cups 15 to lift the sheet 14 upwardly, and cause it to engage narrow inclined rails 129. The rails 129 are aligned longitudinally with the spaces between the cups of sheet 14 and are supported by supports 130 mounted on channel irons 131 extending transversely between the side plates 3.

The sheets 14 are slidable along the rails 129 and are moved along said rails by frictional contact with a plurality of endless belts 132 that extend around pulleys 133 and 134. A sprocket gear 45 mounted on the same shaft as gear 40 drives a chain 135 that extends around another sprocket gear 45' that is mounted on the shaft of pulley 134. The belts 132 engage the rims 18 and are spaced transversely to leave longitudinal gaps aligned with the spaces between the rims of adjacent longitudinal rows of cups 15.

As shown best in FIGURE 15, lower slitting disks 136 are rotatably mounted on a driven shaft 137. The rails 129 are provided with longitudinal slits 129', as shown in FIGURE 16, through which the disks 136 project. Each disk 136 is in alignment with the flat surface 49 between adjacent longitudinal rows of cups 15. The upper edge 138 of each disk 136 is flat, as shown in FIGURE 16, to provide a firm support for the flat surface 49 of sheet 14 between adjacent cups. Upper slitting disks 139 are friction driven and are rotatably mounted on a shaft 140 with one vertical surface 141 of each disk abutting one vertical surface 142 of a lower slitting disk adapted to cooperate therewith. The peripheral surface of each upper slitting disk 139 is tapered, as indicated at 143, and the edge thereof contiguous to surface 142 of the adjacent lower disk 136 overlaps the upper edge portion of said disk 136 to provide a sharp slitting action.

The shaft 140 is mounted on one end of a bell crank 144 having a spring 145 secured to the other end and urging the shaft 140 and upper slitting disks upwardly about the pivot 146 of the bell crank. An adjusting screw 147 engages the upper end of the bell crank 144 to force it downwardly about the pivot 146 against the action of the spring 145. The screw 147 is turned to adjust the position of the upper slitting disks to attain the inter-engagement of disks 136 and 139 necessary for an efficient slitting operation. The slitting disks divide each sheet 14 into eight strips, each of which contains five sealed packages of jelly. The slits pass through the apertures 48, separating them into semi-circular notches, as shown in FIGURE 28.

After the sheet of jelly packages has been slit into strips by the slitting disks 136 and 139, the strips are moved to the speed-up conveyor unit 13, one end of which underlies pulley 134. The speed-up conveyor comprises an endless belt 148 extending around pulleys 149, 150, 151, 152, 153 and 154. The structure of the speed-up conveyor is shown in FIGURES 2, 6, 7, 18, 19 and 20. A tensioning device 154' is provided for the mounting of pulley 154, as shown in FIGURE 19, for adjusting the tension of the speed-up belt 148. Pulley 152, which drives belt 148, is mounted on a shaft 155 and is driven by shaft 31 through gears 156, 157, 158 and 159. Gear 156 is mounted on shaft 31 and is meshed with gear 157 that is mounted on a shaft 160, on which gear 158 is also mounted. Gear 158 is a beveled gear and is meshed with beveled gear 159 which is mounted on shaft 155.

As the strips of jelly packages are carried toward the first cross conveyor by the speed-up belt 148 they are kept in the desired longitudinal alignment by vertically disposed guides 161 that are suspended over belt 148 by rods 162 mounted in suitable brackets 163. Guides 161 are spaced above belt 148, but extend close enough to the belt to be engaged by the edges of the strips of jelly packages being moved by the belt. The center guide is bifurcated to provide a pair of laterally spaced guides as it approaches the first cross conveyor. The guides on each side of the center guide are curved along lines substantially parallel to the adjacent side of the center guide to separate the eight strips of jelly packages into two groups of four strips each as they approach the discharge end of the speed-up conveyor. The portion of the belt 148 near pulley 154, which is adjacent the discharge end of the speed-up conveyor, is supported on a stationary bed 164.

A stop member 165 extends transversely across belt 148 adjacent the edge of stationary bed 164 closest to pulley 154. The stop member may be a strip or a bar having an upstanding wall perpendicular to the plane of bed 164 and mounted in any suitable manner. Each strip of jelly packages is propelled against the stop member and is held thereagainst by the belt 148 until it is moved parallel to the stop member by the first cross conveyor, hereinafter described. The guides 161 terminate in a plane parallel to the stop member and spaced therefrom a distance greater than the length of the strip of jelly packages.

An electric eye system 166 is positioned on the bed 164 in such position that its light beam extends along a line parallel to stop member 165 between the ends of guides 161 and one end of a strip of jelly packages having its other end abutting the stop member. The mechanism, hereinafter described, for controlling the electric eye system keeps the electric eye system de-energized while the strips of jelly packages are being moved past the ends of the guides, so that said strips do not interrupt the light beam in their normal travel. Before the first cross conveyor starts moving, the electric eye system is energized to provide a light beam during the indexing period of the Geneva movement, hereinafter described. If the light beam is not interrupted, the machine continues its normal operation. However, if any of the strips is not in its proper position, with one end abutting the stop member, it interrupts the light beam. Any interruption of the light beam stops the operation of the machine. The operator then manually moves the misplaced strip into its proper position or, if it has been damaged, removes it from the machine, and then presses a starting switch (not shown) to start the machine again.

The cross conveyor system, as shown in FIGURES 18–25, includes a first cross conveyor comprising a series of five endless chains 167 extending around sprockets 168 and 169 mounted on shafts 170 and 171, respectively. The cross conveyor system is driven by a Geneva movement, hereinafter described. The shafts 170 and 171 are rotatably mounted in bearings 172 supported on standards 173 projecting upwardly from a plate 173'. Each chain 167 has a plurality of pusher plates 174 secured thereto and arranged in groups of four. The pusher plates of each group are spaced uniformly, with gaps 175 between adjacent groups of pusher plates. The purpose of the gaps 175 will be hereinafter disclosed. The chains 167

are arranged with the pusher plates of all five chains in transverse alignment.

Parallel guide members **176** depend from transverse rods **177** to support the lower reach of the chains **167** and maintain a definite spaced relationship between the chains and the top of the stationary bed **164**. The pusher plates **174** extend downwardly between the support members far enough to engage the edges of the strips of jelly packages positioned on the upper surface of the speed-up belt **148**. The lower ends of the pusher plates are spaced above the speed-up belt.

When two groups of four strips each of jelly packages are moved past the ends of guide members **161** on the speed-up belt, the pusher plates are positioned to receive all eight strips between the pusher plates of two adjacent groups. The spacing between adjacent pusher plates of each group is approximately equal to the width of each strip, and the pusher plates keep the strips in transverse alignment with the cross conveyor system.

The second cross conveyor **22** comprises an endless chain **178** extending around sprockets **179** and **180** mounted on shafts **181** and **182**, respectively. The shafts **181** and **182** are rotatably mounted in side plates **183** depending below the plane of the stationary bed **164**. The chain **178** carries a plurality of pusher plates **184** that are similar to pusher plates **174** but are wider. The upper edge of the pusher plates being carried by the upper reach of the chain **178** are spaced slightly below the underside of the stationary bed **164**. The pusher plates **184** are spaced longitudinally of chain **178** a distance approximately equal to the length of the tray **19**.

A cross slitting mechanism **21**, shown in FIGURES 2, 18, 20 and 23, comprises a series of upper slitting disks **185** and a complementary series of lower slitting disks **186**. The upper disks are rotatably mounted on a shaft **187** mounted on one end of a bell crank **188** pivotally mounted, as indicated at **189**, on a side plate **190** projecting upwardly from the frame. A screw **191** engages a projection **192** to move the upper slitting disks **185** to any desired position relative to the lower slitting disks, and a spring **193** urges them upwardly as far as the screw **191** permits. The lower slitting disks **186** are mounted on a shaft **194** and are spaced to cooperate with the upper slitting disks in the same manner as the slitting disks **136** cooperate with the slitting disks **139**. The disks **185** and **186** engage the strips of jelly packages along a line between the cups **15** to separate each strip into individual jelly packages.

The longitudinal section **5** of the packaging machine, shown in FIGURES 1–3, 6, 18, 20 and 24, comprises a tray conveyor **195** extending at right angles to the second cross conveyor **22**. Two parallel endless chains **196** and **197** are mounted on sprockets **198**, **199** and **200**, **201**, respectively. Sprockets **198** and **200** are mounted on a shaft **202**, and sprockets **199** and **201** are mounted on a shaft **203**. The shaft **203** is driven intermittently by a Geneva movement, as hereinafter described.

Each chain **196** and **197** has a plurality of pusher plates **204** and **205**, respectively, secured thereto. The pusher plates **204** and **205** are spaced longitudinally of their chains a distance sufficient to allow trays **19** to be positioned between adjacent pusher plates. Each pusher plate **204** is aligned transversely with a pusher plate **205** so that when the tray conveyor is running it delivers two trays at a time in side-by-side relationship to the second cross conveyor **22**. The trays **19** are positioned on the tray conveyor manually.

The tray conveyor includes a stationary bed **206** for supporting the trays **19** in a plane slightly below the plane of the stationary bed **164**. The stationary bed **206** is provided with longitudinal openings **207** and **208** through which pusher plates **204** and **205**, respectively, project to engage the sides of the trays. A central support member **209** carries wings **210** projecting laterally from opposite sides thereof for supporting the upper reaches of chains **196** and **197**. Channel members **211** project upwardly from the wings **210** to support the longitudinal edges of the stationary bed **206**.

The stationary bed **206** is coplanar with a supporting plate **212** that extends across the cross conveyor **22**. The pusher plates **204** and **205** push trays **19** along the stationary bed **206** up to a point adjacent the cross conveyor **22**, and the following trays push the first trays from said point on to plate **212**. A stop member **213**, positioned adjacent the remote longitudinal edge of the cross conveyor **22**, stops the forward tray when it is aligned with the longitudinal center of the cross conveyor **22**. The plate **212** is provided with an opening **214** aligned with the pusher plates **184**. The pusher plates **184** project upwardly through the opening **214** to engage one side of each tray **19** as it engages the stop member **213**. The pusher plates **184** move the trays **19** along the second cross conveyor **22**. Longitudinally extending guide plates **22'** project upwardly from the cross conveyor **22** to center the trays as they are moved parallel to the individual packages of jelly.

The mechanism for driving both cross conveyors and the tray conveyor comprises a double Geneva movement shown in FIGURES 3, 18–20, 23 and 24. The double Geneva movement is driven by the shaft **31** through a gear **215** that meshes with a gear **216** mounted on shaft **155**. The gear **215** is mounted on a shaft **217** to which a bevel gear **218** is fixed. The gear **218** meshes with a bevel gear **219** that is mounted on a shaft **220** to which a pin wheel **221** is secured.

As shown in FIGURE 23, two side plates **222** and **223** are secured to the frame of the machine to provide support for the shaft **220** and for the other shafts, hereinafter described, that are also driven by the double Geneva movement. Suitable bearings **224** are provided for each of the shafts. A bracket **225**, secured to side plate **222**, supports a switch **226** that is connected electrically with the electric eye **166**. The switch is provided with a roller arm **227** adapted to close the circuit and energize the electric eye system when it is pressed inwardly of the switch. The roller arm is spring biased outwardly so that the switch is in the off position at all times except when it is pressed inwardly.

Two projections **228** are mounted on the shaft **220** at diametrically opposite points and engage the roller arm **227** to press it inwardly as the shaft **220** is rotated. The projections **228** are so located on the shaft **220** that one of them engages the roller arm to turn the switch on immediately prior to the time that the cross conveyors **20** and **22** start moving after each interruption. The switch **226** energizes the electric eye system for the duration of the indexing period of the Geneva movement to determine if any of the strips of jelly packages are misplaced relative to the stop member **165**. The electric eye system will stop the entire machine, except for the auxiliary motor **68**, if any of the strips of jelly packages is not properly positioned. In such event, the misplaced jelly package is manually positioned in the proper location, or is removed from the machine. The machine is then started by a switch (not shown). If the strips of jelly packages are positioned properly, the machine continues its regular operation.

Two Geneva wheels **229** and **230**, respectively, are rotatably mounted on shafts **231** and **232** that are equidistantly spaced from shaft **220**. Shafts **231** and **232** are parallel to each other and are at the same vertical level. In FIGURE 23, these two shafts are offset vertically to a very slight extent, to clarify the illustration. The Geneva wheels are duplicates, and each has four radial slots **233** that extend inwardly from the periphery of the wheel and terminate short of the shaft on which the wheel is mounted. The slots in each wheel are spaced 90° from each other and the periphery of the wheel is curved concavely between the slots, as indicated at **234**. Both Geneva wheels are mounted in the same vertical

plane, and this vertical plane is closely adjacent the vertical plane of the pin wheel.

Two pins **235** and **236** project at right angles from diametrically opposite points on the same surface of the pin wheel **221**. Each pin is spaced from shaft **220** a distance equal to the lateral distance between each shaft **231** or **232** and the shaft **220**. The Geneva wheels are so located that when the pins **235** and **236** are in the same horizontal plane, two slots **233** of each Geneva wheel are aligned vertically with one of the pins. As viewed in FIGURE 24, the pin wheel **221** is rotated in clockwise direction. As the pin wheel rotates from the position shown, pin **235** enters the lowermost slot **233** aligned therewith, and pin **236** moves out of its slot. The pin wheel is provided with two arcuate lugs **237** and **238**, the outer peripheral edges of which are adapted to abut the concave edges **234** of the Geneva wheels. The lugs **237** and **238** are diametrically opposite each other and are so arranged that one of them abuts the adjacent concave edge of both Geneva wheels whenever one of the pins is entering a slot in said Geneva wheel. The lugs **237** and **238** prevent the Geneva wheels from wobbling, and thereby facilitate entrance of the pins **235** and **236** into the radial slots of the Geneva wheels.

As the pin wheel is rotated, pin **235** rotates Geneva wheel **229** through 90° in counterclockwise direction while Geneva wheel **230** remains stationary. The pin **235** then enters one slot of the Geneva wheel **230** and rotates said wheel through 90° in counterclockwise direction while the Geneva wheel **229** remains stationary. After such movement, the pin **236** enters one slot in the wheel **229** as the pin **235** moves out of the slot in the wheel **230**. The alternate movement of the Geneva wheels through 90° in the same direction is thus continued as long as the shaft **31** is rotated.

As shown in FIGURES 20 and 23, the double Geneva movement is mounted between the side plates **222** and **223**. The shaft **231** of the Geneva wheel **229** projects through the side plate **222**, and the shaft **232** projects through the side wall **223**.

A bevel gear **243** mounted on the end of shaft **232** outwardly of plate **240** is meshed with a bevel gear **244** that is fixed to a shaft **245**. A sprocket **246** is fixed to the shaft **245**, and an endless chain **247** extends around the sprockets **246** and **201** to drive the shaft **203** of the tray conveyor **195**. An idler sprocket **248** keeps the chain **247** reasonably taut so that it will not slip off either sprocket **201** or **246**. The feeding movement of the tray conveyor is intermittent, and is synchronized with the feeding movement of the individual jelly packages along the cross conveyors **20** and **21**, as hereinafter described.

The operation of the cross conveyors **20** and **22** and the cross slitter **21** is controlled by the Geneva wheel **229**. A sprocket **249**, mounted on the shaft **231**, is connected to a sprocket **250**, mounted on the shaft **194**, by a chain **251**. The shaft **194**, on which the lower slitting disks **186** are mounted, is thus driven by the Geneva wheel **229**. A gear **252**, meshed with an intermediate gear **253** that also meshes with another gear **254**, is secured to the shaft **181** to drive the second cross conveyor **22**. The shaft **182** at the opposite end of conveyor **22** carries a gear **255** that meshes with a gear **256** on a shaft **257**. A chain **258** extends around a sprocket **259** on shaft **257** and the sprocket **169** to drive the upper cross conveyor **20**.

As shown in FIGURES 24 and 25, a series of arcuate cams **260** extend longitudinally of the upper cross conveyor **20** adjacent the left hand edge of the tray conveyor **195**, as viewed in FIGURE 24, to engage the edge portions of the individual jelly packages to support them above the trays **19** that are moved in front of the pusher plates **184**. The trays **19** are moved transversely of the tray conveyor by the pusher plates **184** at a slightly slower rate of speed than the speed of the individual jelly packages that are moved by the pusher plates **174**. Guide plates **22'** align the trays in proper position transversely of the conevyor **22** to receive the individual jelly packages. Spring hold-down fingers **261** extend over the downturned ends of cams **260** and guide the individual jelly packages into the trays. The slight difference in the speed of the trays and the speed of the individual packages enables the packages to move the additional distance necessary to make up the space occupied by the pusher plates as the packages are moved into the trays.

The Geneva wheels **229** and **230** are so related that two trays **19** are moved into the path of pusher plates **184** during the interval that cross conveyors **20** and **22** are stationary, and the tray conveyor is stationary as the pusher plates **174** and **184** push the individual jelly packages and the trays along the cross conveyors. The spacing between the two adjacent groups of pusher plates **174** is equal to the space taken up by the adjacent side walls of two trays **19**, with the result that each group of pusher plates **174** successively moves four rows of jelly packages, each row containing five packages, into a tray **19** as it passes the downturned ends of the cams **260**. The jelly packages of each row are moved into a tray **19** simultaneously.

The trays **19**, each containing twenty individual packages of jelly are then removed onto a conveyor **262** that carries them to the overwrap unit **23**, where they are wrapped with an outer covering of wax paper, cellophane or similar wrapping material. The wrapped trays are then moved from the overwrap unit to the packing station **24** where they are packed in cartons or boxes.

Although there is described an illustrative embodiment of the invention in considerable detail, it will be understood that the description is intended to be merely exemplary rather than restrictive as many details may be modified or changed without departing from the spirit or scope of the invention.

We claim:

1. In a packaging machine, a first conveyor adapted to move a tray in a horizontal plane, a second conveyor disposed at right angles to said first conveyor in a plane parallel thereto, said first conveyor being operable to move a tray into alignment with said second conveyor, said second conveyor being operable to move a tray aligned therewith at right angles to the movement of said first conveyor, a third conveyor parallel to said second conveyor in a plane spaced above said second conveyor, a slitter operatively connected to said third conveyor, a double Geneva movement for driving said three conveyors and said slitter, means for driving said double Geneva movement, said third conveyor being adapted to move a strip of individual, unseparated packages to said slitter, said slitter being operable to slit said strip into a plurality of individual packages, said third conveyor being adapted to move said individual packages into a position above a tray on said second conveyor, said double Geneva movement being adapted to synchronize the movement of said three conveyors, whereby said conveyors move said tray and said individual packages into vertical registration, and means for directing a plurality of said individual packages into said tray simultaneously as said second and third conveyors are moved by said double Geneva movement.

2. A machine for forming a plurality of individual sealed packages simultaneously, said machine comprising a first conveyor for moving a sheet having a plurality of cups formed therein and arranged in rows, means for driving said conveyor, a waxing mechanism operatively connected to said conveyor for applying an adhesive coating to said sheet in the area surrounding each of said cups, a filling unit mounted above said conveyor, means operatively connecting said driving means to said filling unit whereby said filling unit is adapted to fill each row of cups simultaneously as said rows of cups are moved past the filling unit, means for adhering a cover to said

sheet to seal each of said cups, a plurality of slitting disks operatively connected to said first conveyor for slitting said sheet and the cover adhered thereto into a plurality of strips of packages, a stationary bed, a second conveyor aligned with said first conveyor for moving said strips of packages on to said stationary bed, a cross conveyor for moving said strips of packages along said stationary bed transversely of said first and second conveyors, a cross slitter operatively connected to said cross conveyor for slitting each of said strips into individual packages, a tray conveyor for moving a plurality of trays into alignment with said stationary bed in a plane below the plane of said stationary bed, means for moving said trays in a path parallel to and below the path of said individual packages, and means for simultaneously directing said indivdual packages formed from each strip of packages into said trays as said trays and individual packages are moved in said parallel paths.

3. A machine for forming a plurality of individual sealed packages simultaneously, said machine comprising a first conveyor for moving a sheet having a plurality of cups formed therein and arranged in rows, means for driving said conveyor, a mechanism operatively connected to said conveyor for applying an adhesive coating to said sheet in the areas surrounding each of said cups, a filling unit mounted above said conveyor, means operatively connecting said driving means to said filling unit whereby said filling unit is adapted to fill each row of cups simultaneously as said rows of cups are moved past the filling unit, means for adhering a cover to said sheet to seal each of said cups, a plurality of slitting disks operatively connected to said conveyor for slitting said sheet and the cover adhered thereto into a plurality of strips of packages, a stationary bed, a second conveyor aligned with said first conveyor for moving said strips of packages onto said stationary bed, a cross conveyor for moving said strips of packages along said stationary bed transversely of said first and second conveyors, a cross slitter operatively connected to said cross conveyor for slitting each of said strips into individual packages, a tray conveyor for moving a plurality of trays into alignment with said stationary bed in a plane below the plane of said stationary bed, a double Geneva mechanism for moving and synchronizing the movements of said cross conveyor and said tray conveyor, said Geneva mechanism being adapted to move said trays in a path parallel to and below the path of said individual packages, and means simultaneously directing said individual packages formed from each strip of packages into said trays as said trays and individual packages are moved in said parallel paths.

4. In a machine for forming a plurality of individual sealed packages simultaneously, a conveyor for moving a sheet having a plurality of rows of individual cups formed therein, a filling unit positioned above said conveyor for simultaneously filling the cups of a single row with material to be packaged, means for driving said conveyor to move said sheet under and past said filling unit, said filling unit comprising a supply tank containing material to be packaged, a plurality of cylinders, a plunger mounted in each of said cylinders, a pouring spout communicating with each cylinder, a valve communicating with each cylinder, each of said plungers being operable to suck material from said supply tank into one of said cylinders and to discharge said material through said pouring spouts, and means controlled by said driving means for rotating said valves to provide a passage for the material to be packaged between said supply tank and each of said cylinders when said cups are out of alignment with said pouring spouts and to provide a passage for said material between each of said cylinders and one of said cups during the portion of the movement of said sheet when said cups are in vertical alignment with said pouring spouts.

5. In a machine for forming a plurality of individual sealed packages simultaneously, a conveyor for moving a sheet having a plurality of rows of individual cups formed therein, a filling unit positioned above said conveyor for simultaneously filling the cups of a single row with material to be packaged, means for driving said conveyor to move said sheet under and past said filling unit, said filling unit comprising a supply tank containing material to be packaged, a plurality of cylinders, a plunger mounted in each of said cylinders, a plurality of pouring spouts, a valve connecting each cylinder to said supply tank, said plungers being movable in one direction to suck material from said supply tank into said cylinders and movable in the opposite direction to discharge material from said cylinders through said pouring spouts, means connecting said plungers with said driving means and synchronizing the plungers and valves with said driving means, whereby said pouring spouts are open for discharge of material to be packaged and the plungers are adapted to move in the discharge direction when said cups pass under said spouts, and an insert subdividing the cross sectional area of each pouring spout into areas so small that surface tension prevents the material from dripping from said pouring spouts when they are closed by said valve.

6. In a machine for forming a plurality of individual sealed packages simultaneously, a conveyor for moving a sheet having a plurality of rows of individual cups formed therein, a filling unit positioned above said conveyor for simultaneously filling the cups of a single row with material to be packaged, means for driving said conveyor to move said sheet under and past said filling unit, said filling unit comprising a supply tank containing material to be packaged, a plurality of cylinders, a plunger mounted in each of said cylinders, a plurality of pouring spouts communicating with each of said cylinders, a valve connecting each cylinder to said supply tank and to one of said pouring spouts, said plungers being movable in one direction to suck material from said supply tank into said cylinders and movable in the opposite direction to discharge material from said cylinders through said pouring spouts, and means connecting said plungers with said driving means and synchronizing the plungers and valves with said driving means, whereby said pouring spouts are open for discharge of material to be packaged and the plungers are adapted to move in the discharge direction when said cups pass under said spouts, said pouring spouts being closed by said valves and said plungers being adapted to move in the opposite direction to suck material into the cylinders when the portions of the sheet between the cups pass under said pouring spouts.

7. A machine for forming a plurality of individual sealed packages simultaneously, said machine comprising two parallel conveyors, a cross conveyor, said parallel conveyors being operable to move a plurality of sealed, unseparated packages and a plurality of trays into alignment with said cross conveyor, a slitter operatively connected to said cross conveyor for slitting said strips into individual sealed packages, a Geneva movement for driving said slitter and for intermittently moving and synchronizing the movement of said cross conveyor and said parallel conveyors adapted to move the trays into alignment with said cross conveyor, a mechanism operatively connected to said other parallel conveyor for applying adhesive to said packages, means for agitating said adhesive to keep it in fluid condition, a motor operable to drive said Geneva movement, said other conveyor and said adhesive agitating means; an electric eye system operatively connected with said Geneva movement for checking the alignment of said packages with said cross conveyor before said cross conveyor is moved, said electric eye system being operable to stop the operation of the Geneva movement before said cross conveyor is moved thereby unless said packages are in proper position for movement of said cross conveyor, and an auxiliary motor operable to drive said adhesive agitating means when said first mentioned motor is shut off.

8. In a machine for forming a plurality of individual sealed packages simultaneously, said machine comprising a pair of parallel conveyors, a cross conveyor, a shaft for driving one of said parallel conveyors, a motor for continuously rotating said shaft, a second shaft operatively connected to said first shaft, a pin wheel mounted on said second shaft, said pin wheel comprising a disk and a pin projecting from one surface thereof, a pair of Geneva wheels arranged in side by side relationship equally spaced from said second shaft, a third shaft fixed to one of said Geneva wheels, said third shaft being operable to drive said other parallel conveyor, and a fourth shaft fixed to said other Geneva wheel, said fourth shaft being operable to drive said cross conveyor, each of said Geneva wheels having a plurality of radial slots engageable with said pin as said disk is rotated, whereby rotation of said pin wheel causes said pin to enter one radial slot of one Geneva wheel to rotate it a predetermined distance and then

move from said first mentioned radial slot into one radial slot of said other Geneva wheel to drive said cross conveyor and said second mentioned parallel conveyor alternately as said first mentioned conveyor is continuously driven.

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FRANK E. BAILEY, *Primary Examiner.*

A. E. FOURNIER, *Assistant Examiner.*