

May 10, 1955

J. L. FERGUSON ET AL

2,707,922

MATERIAL HANDLING AND PACKAGING MACHINE

Filed Dec. 24, 1951

11 Sheets-Sheet 1

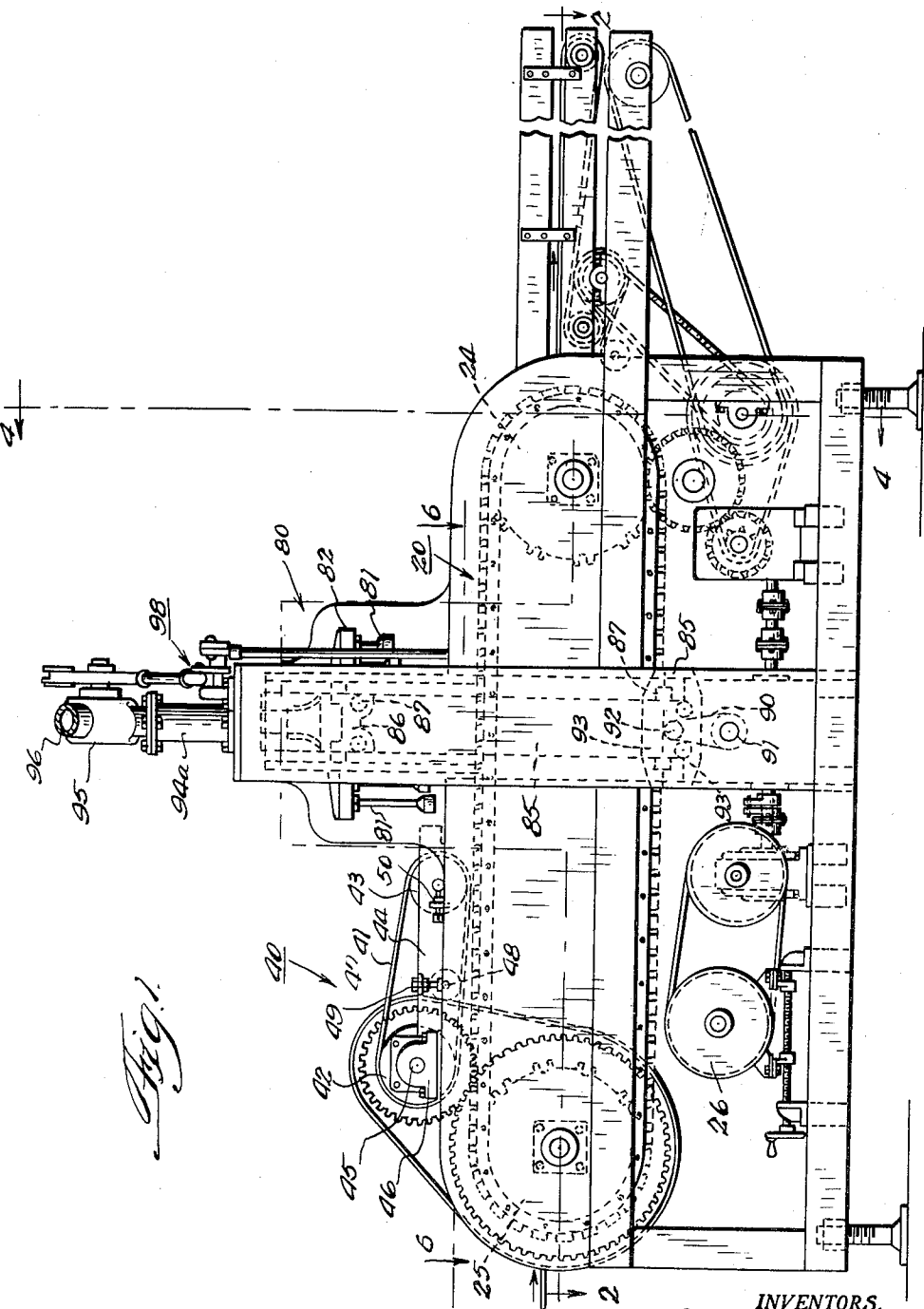


Fig. 1

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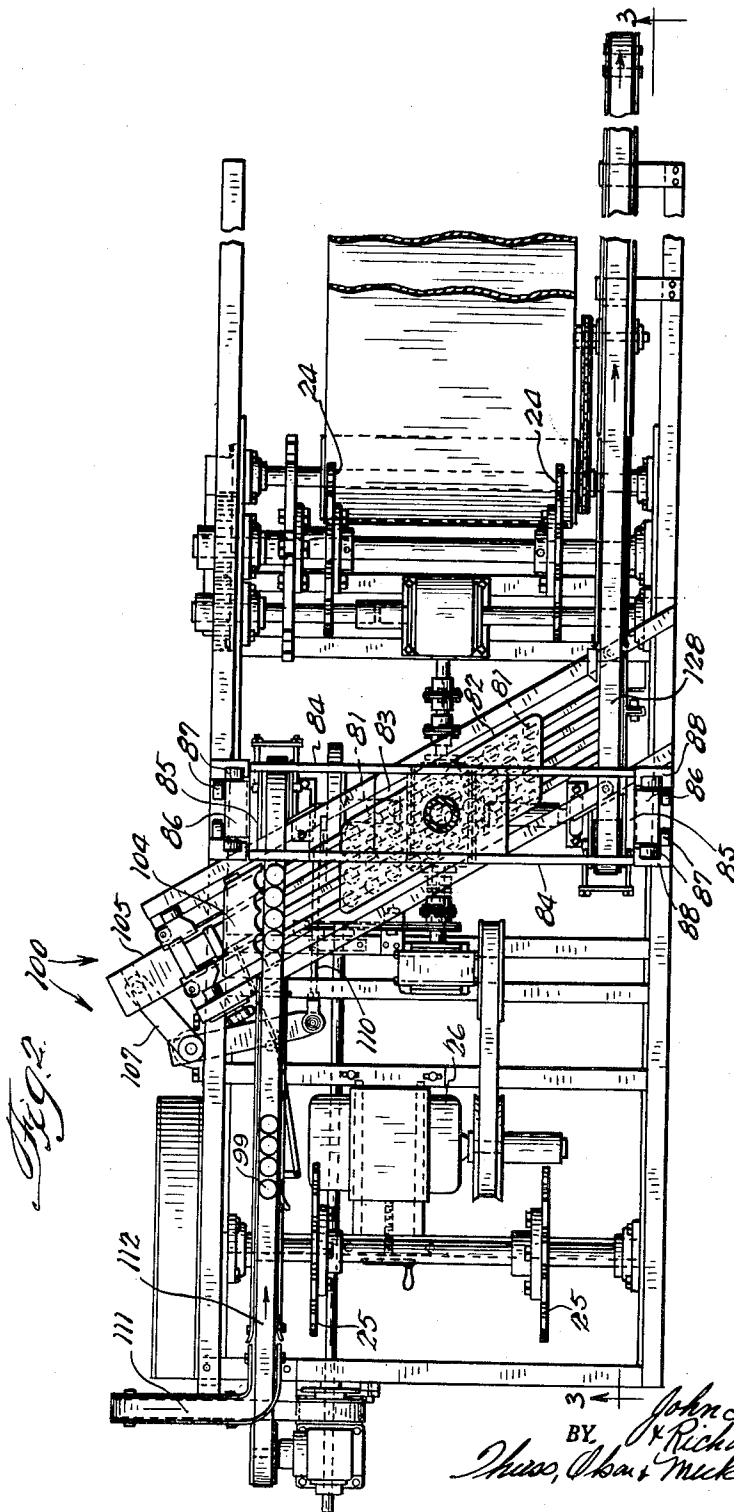


Fig. 2

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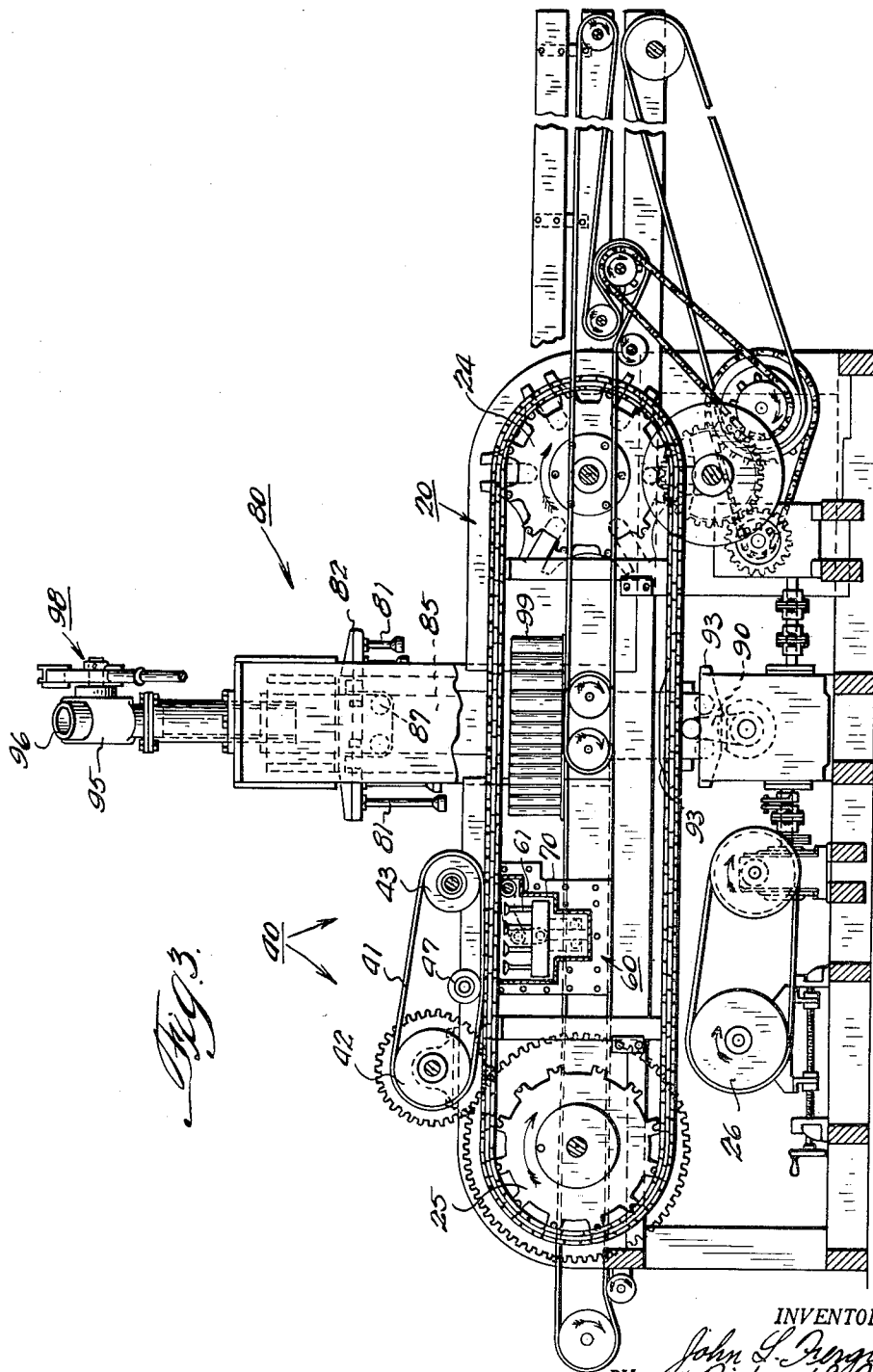


Fig. 3.

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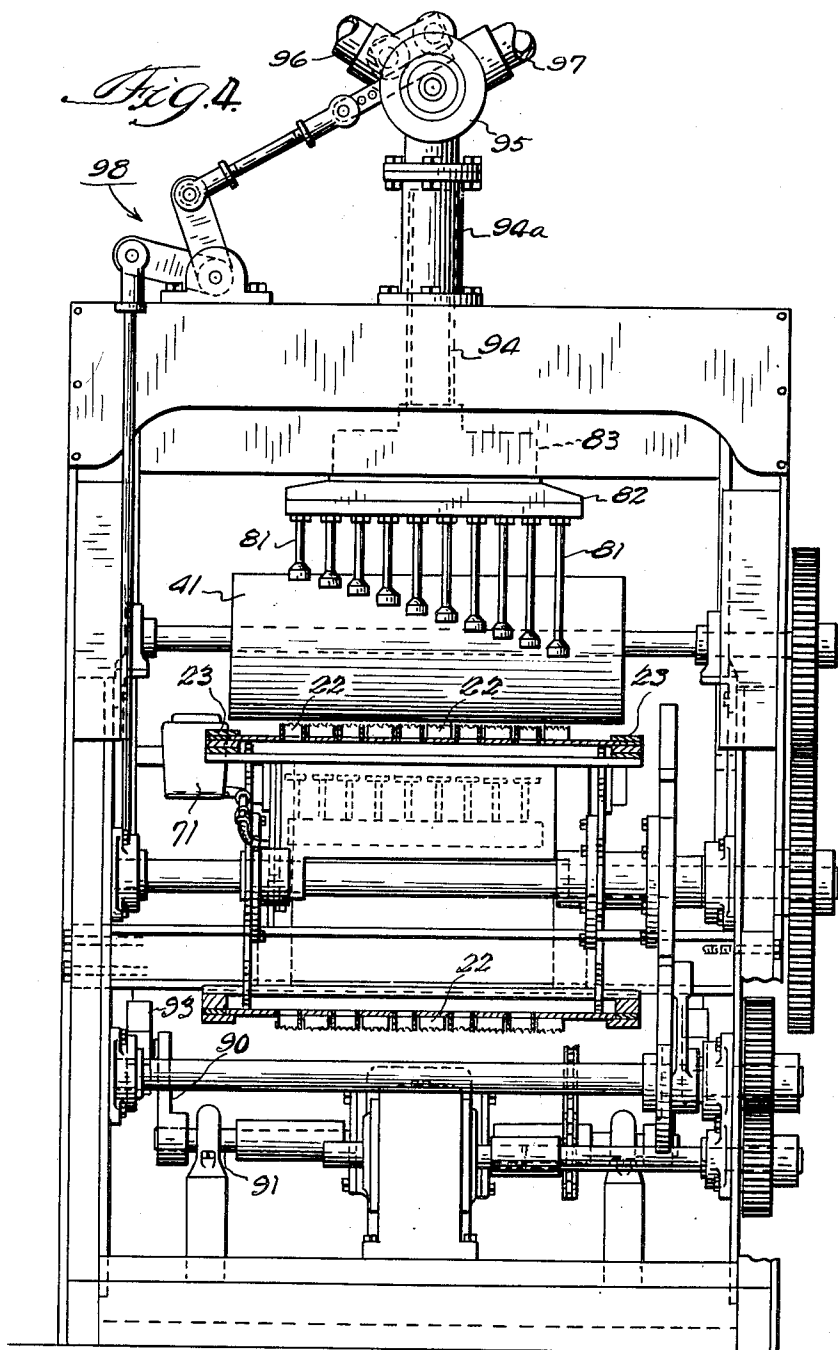
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MATERIAL HANDLING AND PACKAGING MACHINE

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11 Sheets-Sheet 4



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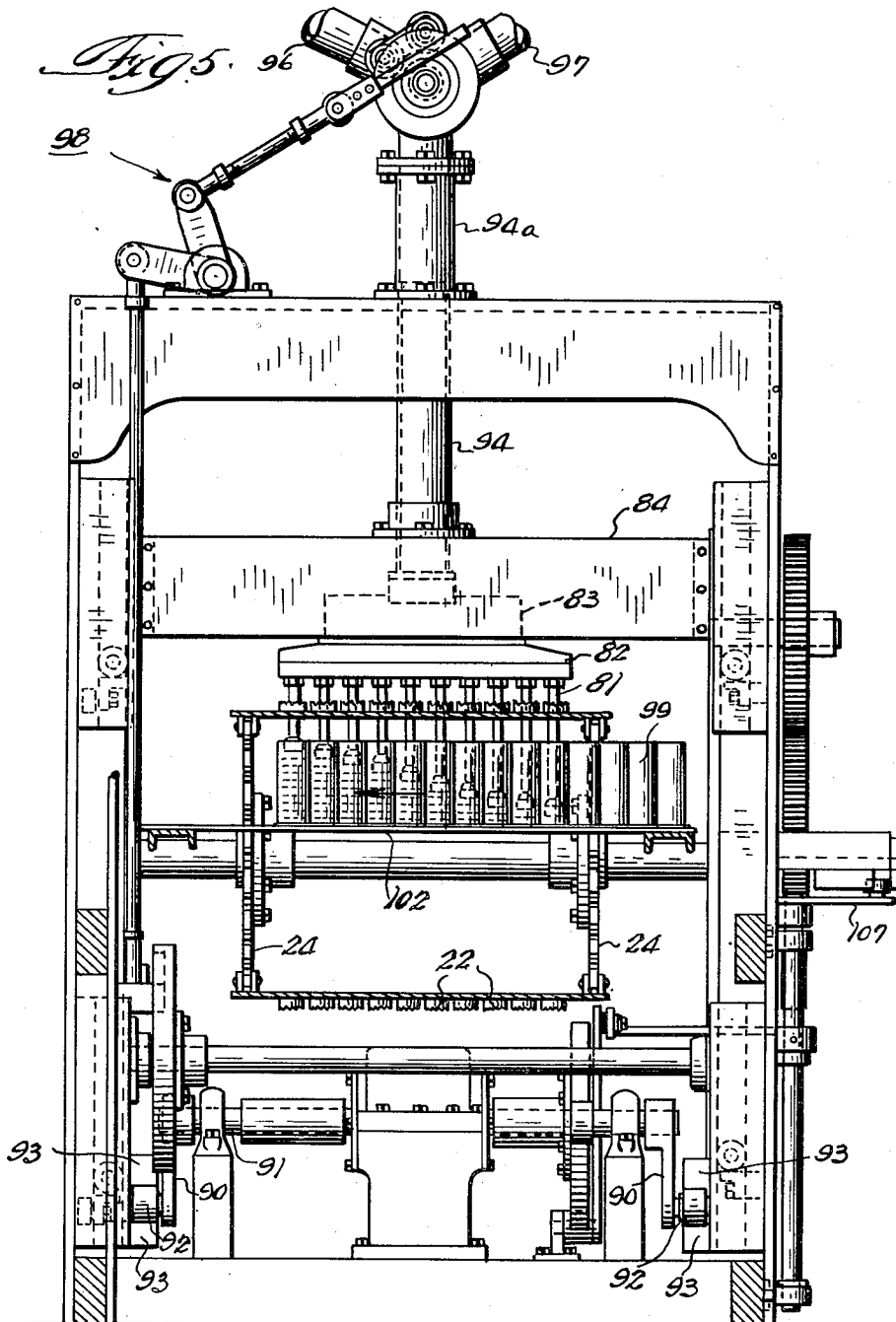
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MATERIAL HANDLING AND PACKAGING MACHINE

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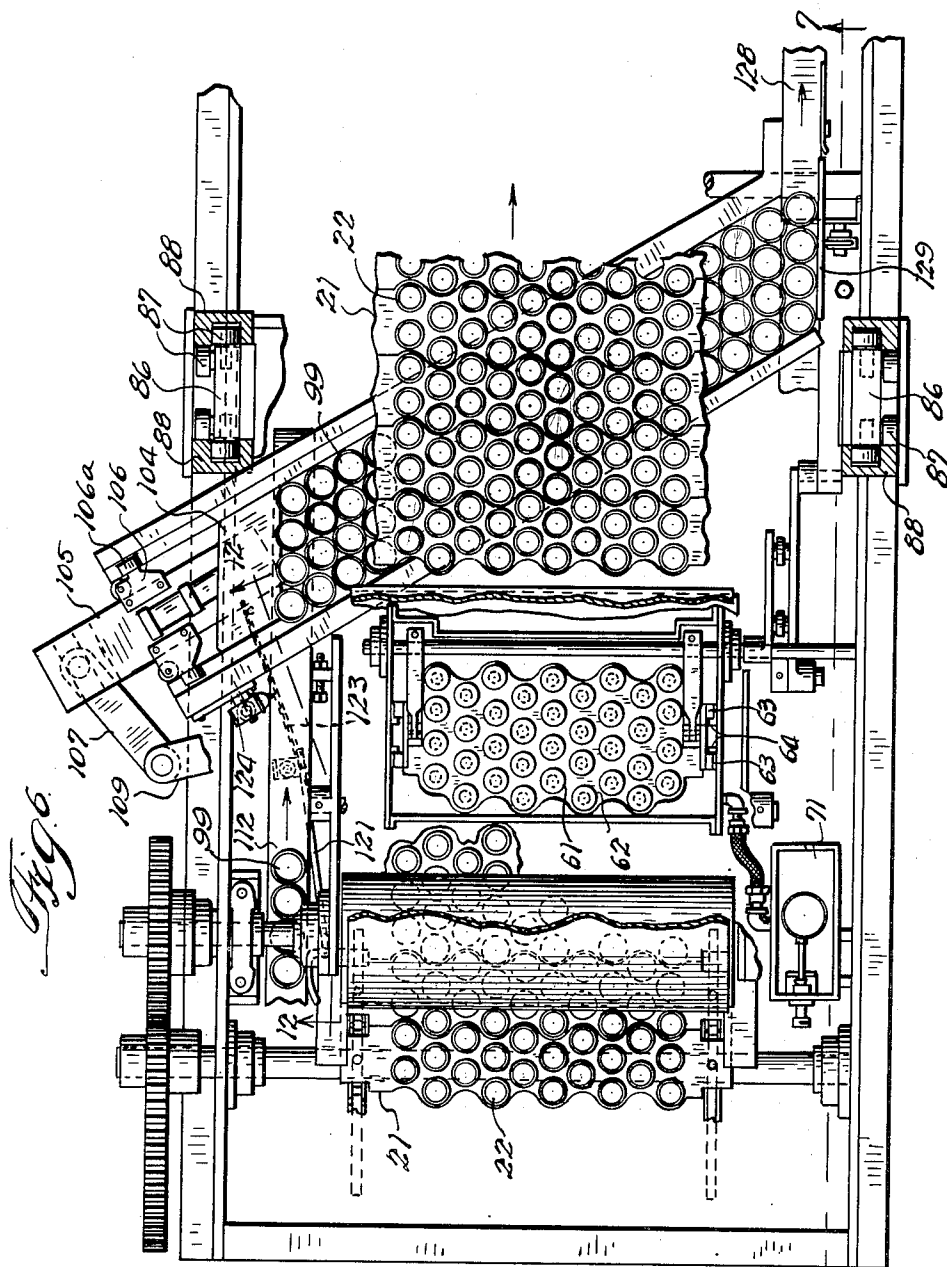


Fig. 6.

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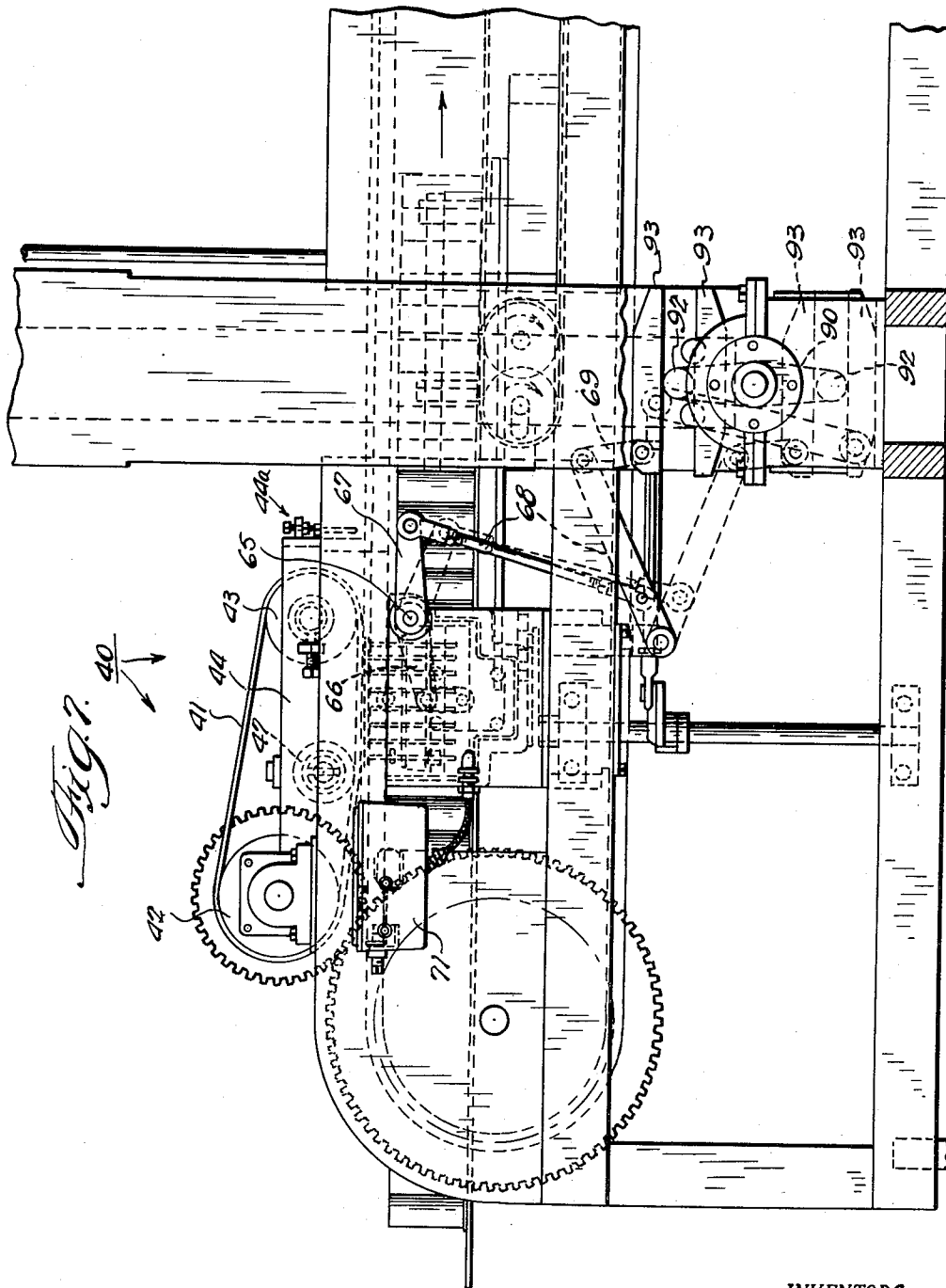
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MATERIAL HANDLING AND PACKAGING MACHINE

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Fig. 8.

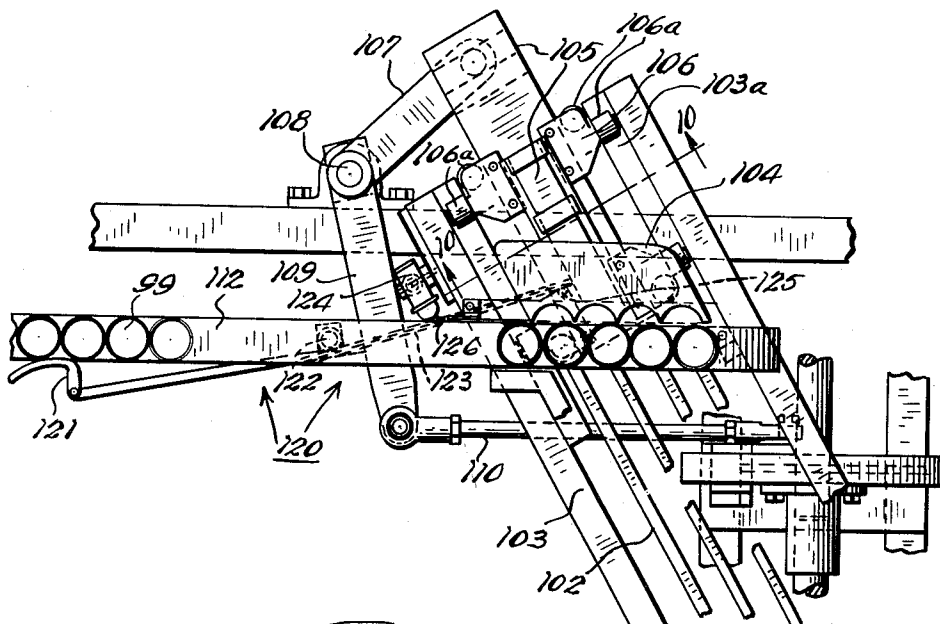
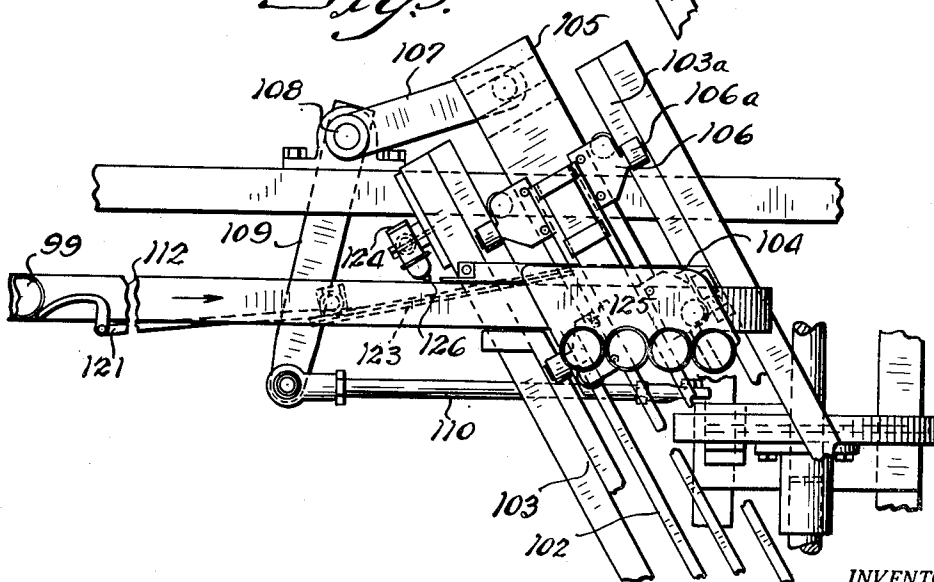


Fig. 9.



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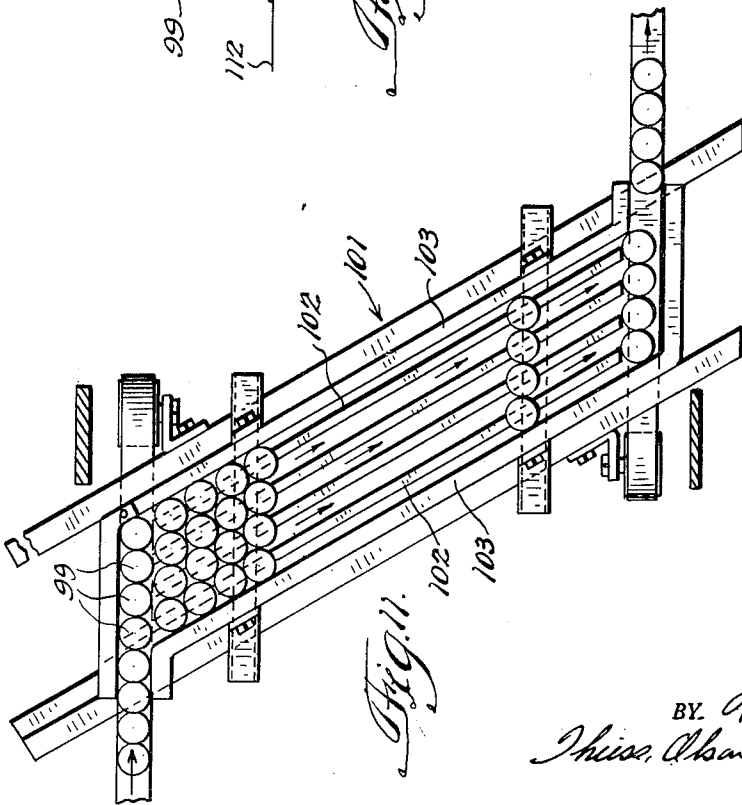
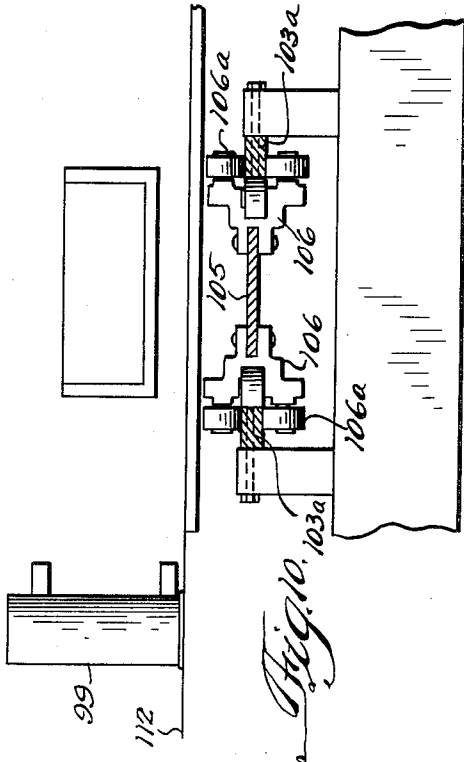
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11 Sheets-Sheet 9



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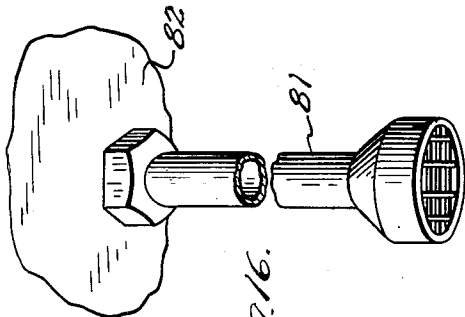
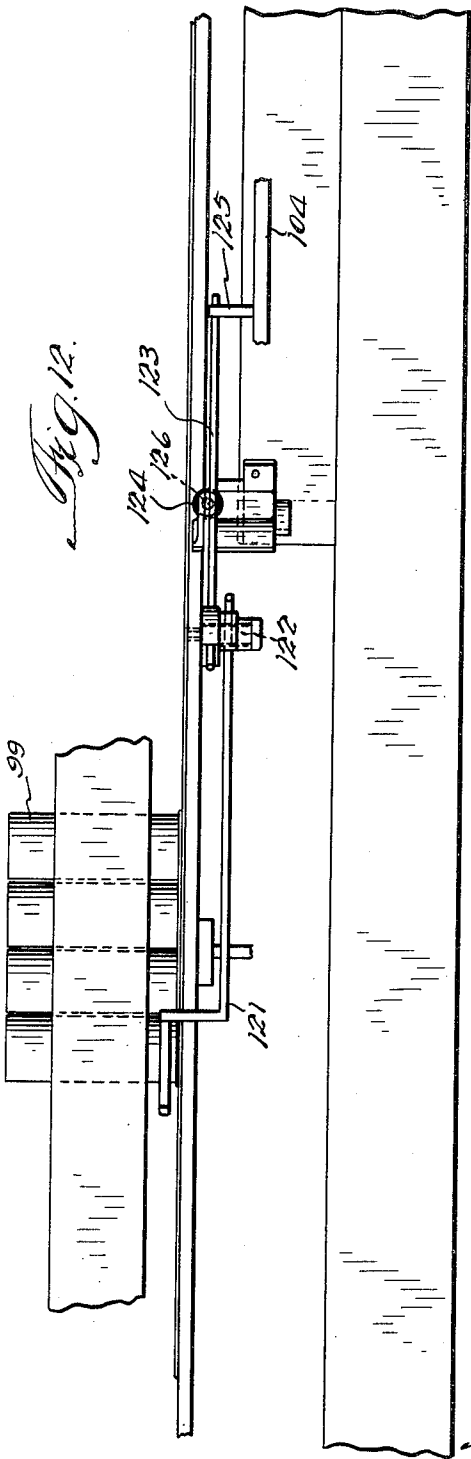
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11 Sheets-Sheet 10



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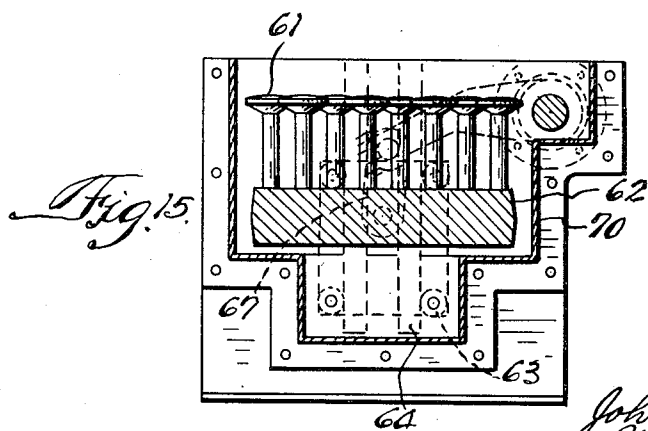
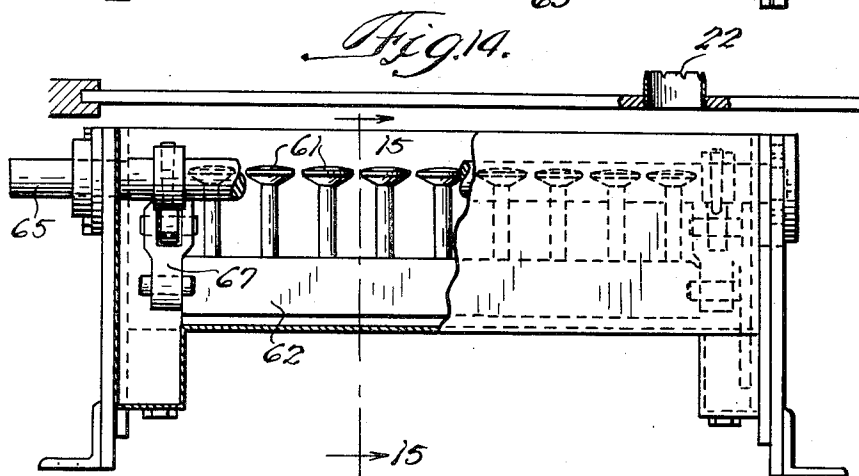
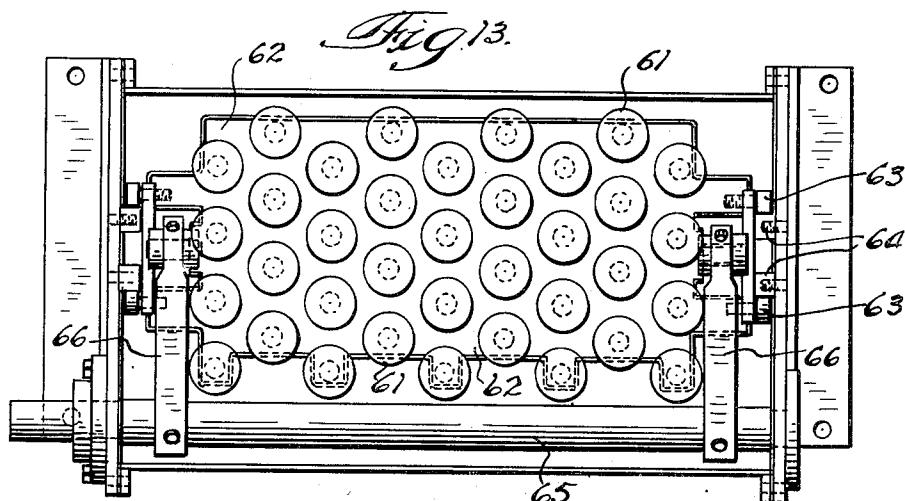
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MATERIAL HANDLING AND PACKAGING MACHINE

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11 Sheets-Sheet 11



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MATERIAL HANDLING AND PACKAGING MACHINE

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Application December 24, 1951, Serial No. 263,108

21 Claims. (Cl. 107—6)

This invention relates to a material handling and packaging machine and more particularly to a machine for cutting sections from a sheet of material and depositing such sections directly into containers. It is an object of the invention to provide an improved machine of such character.

A machine constructed in accordance with the invention is particularly adapted to, but not limited to, cutting sections from a sheet of dough, for example biscuit dough, and inserting a given number of such sections into each one of a continuous supply of cans.

In the cutting and packaging of biscuit dough for home baking it is the present practice to press a continuously supplied sheet of biscuit dough against a continuous chain or belt of cutting dies thereby lodging individual discs of biscuit dough within successive dies. The lower surface of the biscuits are preferably given a thin coat of vegetable oil in order to prevent the dough sections from sticking together after being placed in a can. Subsequently a series of plungers are brought down from above the chain of dies to pass through one or more lateral rows of dies and to force the dough sections through the dies and into awaiting containers below the dies. The latter operation is intermittent, and between plunger strokes the die chain advances longitudinally and the line of containers advances laterally such that when the plungers again descend a new set of dies are located thereunder with dough sections contained therein, and the containers are in position to receive the dough sections forced downwardly through the dies by the plungers. Thus, each successive row or group of rows of dies is brought over the line of containers and is emptied of its dough sections by the plungers, and each successive container as it passes laterally under the die belt receives one dough section from each longitudinal line of dies and is filled when it receives a section of dough from the last file of dies at one edge of the die belt.

It is an object of the invention to provide improved means for pressing such a sheet of dough, for example, against a continuous belt of cutter dies.

It is another object of the invention to provide improved means for applying a film of oil to the lower surface of such dough sections, for example, while contained within the individual dies.

It is another object of the invention to provide an improved die arrangement within a continuous belt of dies for operating on a continuous sheet of material whereby the amount of sheet material which is wasted or which must be reclaimed is substantially reduced.

It is another object of the invention to provide improved apparatus for handling containers for receiving the sections of sheet material cut by said improved arrangements of dies.

It is another object of the invention to provide improved control apparatus for machinery which handles empty containers of light weight.

In accordance with one embodiment of the invention the apparatus which presses the continuous sheet of dough

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against the die belt includes a continuous flexible belt, one portion of said belt being made to press resiliently against said sheet of dough over an extensive, substantially flat plane. Reciprocating oilers are provided which pass upwardly into the individual dies to apply oil to the lower surface of the dough while the intermittently moving die belt is stationary. The individual dies are arranged in the die belt in substantially parallel longitudinal rows, the individual dies of each row being longitudinally staggered with respect to the dies of adjacent longitudinal rows. With this arrangement of dies, particularly where the dies are designed to cut a substantially circular dough section, the dies may be so arranged as to result in much less dough wasted or required to be reworked.

The package handling machinery which forms a part of the integral machine is arranged to advance containers under the belt in such a formation that they may be in position during operation of the plungers to receive dough sections from the dies.

In a machine such as that described above, it is desirable for obvious reasons that operation be terminated in the event that the supply of empty containers to the machine is interrupted. The containers normally used for the packaging of biscuit dough are preferably light walled cylinders whose diameters are very small relative to their heights. In the handling of such containers a problem arises in the detecting of the presence of a container at some predetermined position in the supply file by mechanical means since even very lightweight detecting means may upset the containers. In accordance with the preferred embodiment of the invention the detecting means are made inoperative during movement of the supply file and are effective to detect the presence of a container only during such time as the file is stationary.

Accordingly, it is another object of the invention to provide an improved machine for cutting sections from a continuous sheet of biscuit dough, and arranging such sections in lightweight containers.

This invention, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings, in which like parts are designated by like reference numerals:

Fig. 1 is an elevational view of a machine embodying the invention;

Fig. 2 is a cross-sectional plan view of the machine taken along the line 2—2 of Fig. 1 but omitting certain portions of the apparatus;

Fig. 3 is a cross-sectional elevational view taken along the line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional end elevation taken along the line 4—4 of Fig. 1;

Fig. 5 is a view similar to Fig. 4 but omitting certain portions of the apparatus and showing other portions in a different operating position;

Fig. 6 is a cross-sectional plan view taken along the line 6—6 of Fig. 1;

Fig. 7 is a cross-sectional elevation taken along the line 7—7 of Fig. 6;

Fig. 8 is a partial plan view of the same machine illustrating certain control apparatus and carton advancing apparatus;

Fig. 9 is a view similar to Fig. 8 but showing the apparatus in a different operating position;

Fig. 10 is a cross-sectional view taken along the line 10—10 of Fig. 8;

Fig. 11 is a partial plan view showing portions of the carton conveying apparatus;

Fig. 12 is a partial cross-sectional elevation taken along the line 12—12 of Fig. 6;

Fig. 13 is a partial plan view of the same machine showing biscuit oiling apparatus;

Fig. 14 is an elevational view of the apparatus disclosed in Fig. 13;

Fig. 15 is a cross-sectional view taken along the line 15—15 of Fig. 14; and

Fig. 16 is a perspective detailed view, partially broken away, of one element of the machine.

The embodiment of the invention disclosed in the drawings is intended for cutting circular sections from a continuous sheet of biscuit dough and depositing the cut sections in containers. It is to be understood, however, that the whole invention and various features thereof are readily adaptable to many applications.

In the particular embodiment of the invention shown, biscuit dough is fed continuously onto an endless, intermittently moving die belt 20 by apparatus which does not form a part of the invention and which, accordingly, is not shown in the drawings. The dough is carried forward by the die belt 20 to pressing apparatus 40, including an endless belt 41, which forces the dough down into the individual dies of the die belt, thereby cutting out dough sections of the desired size.

Located immediately below the pressing apparatus 40 is oiling apparatus 60 which applies a thin sheet of oil to a plurality of dough sections while contained in the respective individual dies. The oil film so applied to the cut sections of dough tends to prevent the dough sections from sticking together after being deposited in cartons one upon the other. It is preferable that the oil film be applied only to the cut sections of dough since the remaining portion of the dough lying between the cut sections is preferably salvaged and reworked into a continuous sheet of dough. If the entire sheet were oiled on one side, the oil on the reclaimed dough would of course be worked into the dough and alter its composition.

As the dough is carried forward from the oiling apparatus 60, it is brought under plunger apparatus 80 which is arranged to drive the cut sections of dough downwardly through the individual dies while the die belt is stationary and into awaiting containers located below the die belt.

Cartons 99 are advanced to proper positions below the die belt by conveyor apparatus 100, the function of which is to convert a single file of cartons into a multiple file in which each carton is intermittently advanced transversely of the die belt, between successive positions in each of which the carton is in position to receive one cut section of dough. Control apparatus 120 is provided for interrupting or terminating operation of the machine in the event that the supply of empty containers falls below a predetermined minimum. This operation is intended, of course, to prevent the possibility of continued operation of the machine when no cartons are available to receive the cut sections of dough as they are forced downwardly through the die belt by the plunger apparatus 80.

The cartons normally employed for packaging biscuit dough are conventionally tall, thin cartons of very light weight. Conventional, mechanical apparatus for detecting the presence of a carton is unsatisfactory because it tends to knock down or damage the cartons as they pass by the detecting apparatus. One feature of the invention is mechanical carton detecting apparatus which operates intermittently and only when the supply file of cartons is stationary. This arrangement eliminates the necessity of resorting to relatively expensive and less reliable non-mechanical detecting means.

Referring now to the various parts of the machine in detail, the die belt 20 comprises a plurality of laterally extending die plates 21 best seen in Fig. 6. Each die plate 21 carries two transverse rows of dies 22, each row including ten individual dies.

It will be noted that the individual dies of each transverse row are staggered, the staggering of the various transverse rows being uniform. It has been found that this staggering of the dies results in a 22% reduction in

the amount of dough which must be discarded or reprocessed, as compared to a die arrangement employing straight transverse rows of dies. It will be understood, of course, that those portions of the dough which overlie the individual dies will be converted into biscuits while those portions which lie intermediate the dies will not be cut into biscuits but must be discarded or reclaimed and reworked into a continuous sheet. With the arrangement of dies as illustrated in Fig. 6 a much smaller percentage of a sheet of dough lies intermediate the individual dies and hence a smaller percentage of the dough must be reclaimed as compared to a die arrangement employing straight transverse rows of dough.

The die plates 21 preferably have scalloped or undulating forward and rearward edges to permit close spacing of the dies of one die plate with the dies of the adjoining die plates. The individual dies may be of any suitable form but are preferably constructed in accordance with application Serial No. 154,404 entitled "Device for Cutting and Handling Dough," filed April 6, 1950 by Carl T. Head.

The die plates 21 are joined together by any suitable form of links, the die belt is guided by any suitable means such as the bars 23 extending along both sides of the belt and passes over a pair of sprockets 24 at the forward end of the machine and another pair of sprockets 25 at the rearward end of the machine as viewed in Fig. 1, and the sprockets 25 are powered by an electric motor 25 through a suitable form of intermittent drive means such as a Geneva movement, all preferably as illustrated in application Serial No. 143,428 entitled "Machine for Forming and Packing Blanks of Dough," filed February 10, 1950, by Lowell Armstrong, Lively B. Willoughby, Rogers C. B. Morton and Harlan How, now Patent No. 2,664,833 dated January 5, 1954. Since these elements of the machine may be of any suitable form and do not of themselves constitute features of the invention they are not disclosed or described in detail herein. For the purpose of describing the present invention, it is believed to be sufficient to point out that the die plates 21 are formed into a continuous flexible die belt which is guided along a predetermined path and driven in an intermittent motion.

The endless belt 41 which forms a part of the dough pressing apparatus 40 extends over a pair of rollers 42 and 43 whose axes are linked together by a frame 44. A shaft 45 upon which the roller 42 is mounted extends through the sides of the frame 44 and into bearings 46 which are secured to the frame of the machine, whereby the roller 43, as well as the entire frame 44, may swing about the shaft 45. The forward end of the frame 44, the right-hand end in Fig. 7, is supported on the main frame of the machine by any suitable adjustable apparatus such as that generally designated 44a.

As biscuit dough is fed onto the die belt 20 it passes under the roller 42 which is so spaced above the die belt 20 that the pressing belt 41 does not engage the dough as it passes under this roller. However, the roller 43 is so adjusted that as the dough passes thereunder it is pressed down into the die belt 20.

A third roller 47 is preferably arranged intermediate the rollers 42 and 43 on the frame 44, a shaft 48 upon which the roller 47 is carried being vertically adjustable with respect to the frame 44 by any suitable adjusting apparatus such as that generally designated 49 in Fig. 1. The roller 47 is preferably so adjusted that the rollers 47 and 43 may engage the die belt 20 simultaneously. In this case the dough will be pressed into the die belt by the pressing belt 41 at a point directly below the roller 47.

Whether or not the third roller 48 is employed, it will be apparent that the dough will be pressed into the die belt gradually with attendant reduction in the possibility of the sheet of dough being torn or stretched thin. Where the third roller 47 is employed, the sheet

of dough is maintained within the die belt 20 over a distance extending longitudinally of the die belt 20 between the roller 47 and the roller 43. This is desirable in combination with the dough oiling apparatus described below.

The roller 43 is preferably adjustable with respect to the frame 44 in a horizontal direction by any suitable apparatus such as that generally designated 50 in Fig. 1. This adjustment permits tightening or slackening of the pressing belt 41, all as is well understood in the art.

The oiling apparatus 60 may best be seen in its relationship with the entire machine in Figs. 3, 4 and 6, and the details thereof are best seen in Figs. 7, 13, 14 and 15. The apparatus includes a plurality of individual oilers 61 rigidly secured to a plate 62, this entire assembly being arranged for vertical reciprocatory movement. At each side of the plate 62 there is secured thereto rollers 63 adapted to cooperate with corresponding guides 64 secured to the frame of the machine, all as best seen in Fig. 13.

The oiler assembly comprising the plate 62 and the individual oilers 61 is driven in a vertical reciprocatory movement by apparatus best seen in Figs. 6 and 7. A shaft 65 is rotatably mounted in the frame of the machine and carries a pair of arms 66 at opposite sides of the plate 62. The arms 66 are connected to the plate 62 by links 67 best seen in Fig. 15, these links being pivotally connected to the plate 62 and to the free ends of the corresponding arms 66. A driving arm 67 is also secured to the shaft 65 and is connected to arms 68 and a link 69, as shown, the latter being pivotally connected to a vertically reciprocating member described below.

It will now be apparent that as the link 69 is moved up and down the various elements of the oiler drive mechanism 65-69 will be oscillated and the oiler assembly will be reciprocated vertically.

It has previously been pointed out that the die belt 20 is advanced with an intermittent motion. The driving apparatus for the die belt and for the oiling apparatus 60 is synchronized and arranged in proper phase relationship such that as the individual oilers 61 approach the die belt on their upward stroke, the die belt is stationary. The upward stroke of the oilers 61 carries the heads thereof into the individual dies 22 of the die belt such that they may contact the lower surface of the dough which has been pressed into these dies. The oilers 61 then descend, and when they are free of the dies the die belt is again advanced.

The oilers 61 and the plate 62 are arranged in a housing or vat 70 which is partially filled with oil, the oil being fed to the vat 70, and its level therein automatically controlled, by float apparatus 71 seen in Figs. 4 and 7. The float apparatus may be of any suitable form and maintains the oil in the vat 70 at a level slightly above the upper surfaces of the individual oilers 61 when the latter are in their lowermost position. Accordingly, each time that the oiler assembly reaches its lowermost position the heads of the oilers 61 are submerged in the oil bath, and each time that the assembly rises they apply a thin film of oil to the biscuits or cut sections of dough within the corresponding dies 22.

As previously indicated such a thin film of oil is desirable as it prevents the biscuits from sticking together after they have been deposited in containers. It will be apparent that since the oil film is applied to the lower surface of the biscuits no oil need be applied to the biscuit which enters a carton first and hence is arranged at the bottom of the carton. For this reason it may be seen in Fig. 6 that there are only nine longitudinal rows of oilers 61 while there are ten longitudinal rows of dies 22. More specifically, the left-hand row of dies, the uppermost row in Fig. 6, carries biscuits past the oiler without their being contacted by the oilers, these biscuits being the first to enter the cartons 99

as is explained in the ensuing description of the operation of the machine.

Each intermittent movement of the die belt 20 advances the belt by a distance equivalent to four transverse rows of dies. Accordingly, four transverse rows of individual oilers 61 are provided, these rows of oilers being staggered to correspond to the staggered transverse rows of dies. With this arrangement each biscuit is contacted once by one of the individual oilers 61 as it passes by the oiling station, with the exception of the biscuits in the left-hand row of dies as explained immediately above.

The presence of the pressing belt 41 in contact with the upper surface of the dough sheet immediately above the oiling station provides a firm backing for the dough sheet as the oilers strike the lower surface of the biscuits. This permits the oilers to engage the biscuits firmly and prevents the possibility of a biscuit being permanently upwardly dislodged from an individual die 22.

As the dough sheet is carried forward from the oiling station by the die belt 20 it reaches a position below the plunger apparatus 80, best seen in Figs. 1-5. As briefly explained above the purpose of the plunger apparatus is to drive the cut and oiled sections of dough downwardly through the die belt into the containers 99 positioned below the die belt.

As may be seen best in Fig. 2, four rows of individual plungers 81 are provided, each transverse row including ten plungers, one for each longitudinal row of dies in the die belt 20. It will be noticed that the rows of plungers 81 are not staggered in the manner of the oilers 61 but are arranged askew of the longitudinal rows of dies. The purpose of this arrangement will be made clear in the description of the carton conveying apparatus below. For the purposes of describing the plunger apparatus 80, it will be sufficient to understand that each of the plungers 81 is so located that it may enter an individual die 22 between intermittent movements of the die belt 20.

The plungers 81 are mounted on a common vertically reciprocating support 82, the plungers extending downwardly therefrom. The support 82, as may be seen in Fig. 2, is a parallelepiped of such shape as to encompass the area covered by the individual plungers 81, and is in turn secured to a plate 83. A pair of bars 84 support the plate 83 and extend to the opposite sides of the machine.

At both sides of the machine the two plates 84 are joined by rigid members 85 which, with the bars 84, form a rigid boxlike framework. The members 85 are of a platelike construction and, as may be seen in the drawings, extend downwardly toward the base of the machine. To each of the members 85 there is secured a pair of bearing supports 86 one adjacent the upper end of the member 85 and one adjacent the lower end thereof.

Four rollers 87 are rotatably mounted on each of the bearing supports 86, these rollers engaging vertical tracks 88 as shown in Fig. 2. The tracks 88 guide the rollers and the members 85 in a vertical path and thereby restrict the plunger apparatus 80 to a vertical reciprocatory movement.

A rotating crank 90 may be seen in Figs. 1 and 3 which is mounted on and driven by a shaft 91. At the free end of the crank is a roller 92 which is engaged by a pair of rails 93 secured to the member 85. It will be apparent that rotation of the crank 90 from the position illustrated in Figs. 1 and 3 will draw the member 85 and the entire plunger apparatus 80 downwardly to the position illustrated in Fig. 5, the roller 92 at the free end of the crank arm bearing downwardly against the lower rail 93. Continued rotation of the crank 90 will raise the plunger apparatus again to the position illustrated in Figs. 1, 3 and 4, the roller 92 bearing upwardly against the upper rail 93. As may be seen best in Fig. 5 both of the members 85, at opposite sides of the machine, are driven, the shaft

91 carrying crank arms 90 at both ends thereof and rails 93 being secured to both of the members 85.

The link 69, previously referred to, which drives the oiler apparatus 60 is pivotally connected to the upper rail 93 at the right-hand side of the machine as may be seen in Figs. 6 and 7. It may be seen that as the plunger apparatus rises, drawing the individual plungers out of the dies, the oilers 61 are lowered, whereby they, too, are removed from the dies.

The driving means for the shaft 91 and the crank arms 90 is the same as that for the die belt 20 whereby the die belt and the plunger apparatus may readily be maintained in synchronism and in a definite phase relationship. The plungers 81 are so timed that they enter the individual dies to force the cut sections of dough into the containers 99 during the intervals that the die belt 20 is stationary.

It will be understood by those skilled in the art that the motion transmitted to the plunger apparatus 80 by the crank arms 90 is simple harmonic motion. This means that the plunger apparatus is smoothly accelerated and decelerated with resultant minimizing of depreciation from shock of the rapidly operating plunger apparatus. It has been found that such movement of the plunger apparatus is possible without interference with movement of the die belt if the stroke of the plunger apparatus is made of the proper magnitude. More specifically, the longest of the plungers 81 is arranged to rise a substantial distance above the die belt 20 at the uppermost portion of its stroke. This excess movement of the plunger apparatus has been found to be much less objectionable than the sudden and rapid acceleration of the plunger apparatus which would be required if the plungers 81 were removed only slightly above the die belt at the uppermost portions of their strokes.

It will be noted in the drawings that the plungers 81 are of varying lengths. More specifically the four plungers at the right, as viewed in Figs. 4 and 5, are longer than the other plungers, the length of the plungers decreasing uniformly toward the left.

The biscuits which are driven through the individual dies 22 into awaiting cartons by the right-hand plungers 81 are intended to be deposited at the bottom of the containers 99, all as will be explained in detail below in connection with the carton conveying apparatus. For this reason the right-hand plungers may be and preferably are of substantial length in order that they may convey the biscuits downwardly to a point closely adjacent the bottom of a carton. The adjacent group of four plungers drive biscuits into containers which already have one cut section deposited therein. Accordingly, these plungers are made shorter than the right-hand plungers by an amount approximately equal to the thickness of the dough. This gradual decrease in the length of the plungers continues to the left-hand group of four plungers which deposit biscuits into containers which already contain nine biscuits.

The biscuits may tend to stick to the bottom of the plungers 81 with the result that they might be withdrawn from the container when the plungers move upwardly. Conversely there may be no adhesion between the biscuits and the plungers with the result that the biscuits may drop free of the plungers after they have been removed from the corresponding dies 22 and be folded or otherwise distorted within a carton rather than being deposited flat on the bottom of a carton or on top of another biscuit. Accordingly, pneumatic means are preferably employed for maintaining the biscuits in contact with the bottoms of the plungers during the downward stroke of the plungers and subsequently for blowing the biscuits free of the plungers as the plungers begin their upward movement. A pneumatic system for accomplishing these functions is disclosed and claimed in application Serial No. 143,428 referred to above, and accordingly is described only briefly herein.

The pneumatic controlling of the biscuits after their

removal from the die belt may be accomplished by providing hollow plungers 81 having a screened lower surface as seen in Fig. 16. The upper ends of the hollow plungers 81 are connected through telescoping tubes 94 and 94a to a three-way valve 95 which alternately connects the telescoping tubes 94 and 94a and hence the plungers 81 to tubes or pipes 96 and 97. One of these tubes is connected to a source of compressed air while the other is connected to a vacuum pump.

Control apparatus 98 for the valve 95 is driven in synchronism and in proper phase relationship with the die belt 20 and the plunger apparatus 80 such that as the plunger apparatus starts its downward stroke the valve 95 connects the plungers to the vacuum pump. Accordingly, as the plungers strike the biscuits and drive them downwardly through the individual dies the vacuum tends to hold the biscuits against the lower surfaces of the plungers. When the plungers reach the bottom of their strokes the valve 95 is operated to connect the plungers to the source of compressed air. Accordingly, as the plungers move upwardly the biscuits are blown gently away from the plungers whereby it is assured that they will remain in the cartons flat against the bottom of the carton or on a previously deposited biscuit.

The carton conveying apparatus, previously referred to, will now be described in detail. The primary purpose of the carton conveying apparatus is to advance cartons with an intermittent movement below the die belt 20, whereby the various cartons are repeatedly halted in such positions that they may receive biscuits forced downwardly through the die belt by the plunger apparatus.

The carton conveying apparatus advances the cartons in a direction parallel to the aligned, angularly disposed rows of dies which result from the uniform longitudinal displacement of the dies in the adjacent longitudinal rows thereof.

In the illustrated embodiment of the invention, the angle between the longitudinal and transverse rows of the dies and of the plungers is 60°. This particular angular relationship not only results in leaving a minimum of dough to be discarded or reworked, but it considerably facilitates positioning of the cartons in alignment with the dies. As may be seen in Fig. 6, with this angular relationship between the longitudinal and transverse rows of cartons 99 on the conveying apparatus 100, the cylindrical cartons 99 are completely nested, each carton within the group being in contact with the adjacent cartons in each of six directions from it. The cartons thus occupy the minimum horizontal area and tend to retain their relative positions as they are moved across the machine.

The conveyor apparatus 100 includes a platform 101 best seen in Fig. 11, having four parallel bars 102 for supporting four rows of cartons, and a pair of rails 103 for confining the multiple row of cartons. The rails 103 and the bars 102 are arranged parallel to the aligned angularly disposed rows of dies resulting from the uniform longitudinal staggering of the dies, as indicated above, and are spaced apart by a distance such that they will just admit between them four angularly disposed transverse rows of cartons, fully nested together, as above described.

A plunger 104 is provided for intermittently advancing groups of four cartons 99 along the platform 101. The plunger 104 is mounted on a bar 105 which has secured thereto four bearing supports 106, best seen in Figs. 8, 9 and 10. Each of the bearing supports 106 carries three rollers 106a which contact tracks 103a secured to the rails 103. By this means the plunger 104 is restricted to linear reciprocatory movement parallel to the paths of the cartons as they travel along the platform 101.

The bar 105 extends rearwardly beyond the rearward bearing supports 106 and is pivotally engaged by a crank arm 107. This crank arm is driven by a shaft 108, another crank arm 109 and a rod 110 as may readily be

seen by reference to Figs. 8 and 9. The rod 110 is in turn driven by the same drive mechanism as propels the die belt 20 and the plunger apparatus 30, and accordingly, may be maintained in synchronism and in proper phase relationship therewith. More specifically, the plunger 104 is arranged to advance the columns of cartons during the period that the die belt is being advanced and the plunger apparatus is elevated. During the return stroke of the plunger 104 and while the columns of cartons on the platform 101 remain stationary the die belt is also stationary and the plunger apparatus descends to deposit biscuits in the various cartons under the die belt.

Each stroke of the plunger 104 advances the columns of cartons by a distance equal to the diameter of one carton since it is only by the addition of four new cartons in front of the plunger 104, by means subsequently to be described, that the plunger is able to advance the columns of cartons. The individual dies 22 of the die belt and the individual plungers 31 are also so arranged that the plungers and dies in the aligned angularly disposed rows thereof are spaced apart by a distance equal to the diameter of the cartons 99.

Accordingly, when four cartons are arranged below the first longitudinal row of dies and below the four longest plungers 31 they receive one biscuit each as a result of the downward movement of the plunger apparatus 30. The next operation of the plunger 104 advances these same four cartons to a position immediately below the second longitudinal row of dies in which position they receive a second biscuit each, when the plunger apparatus 30 again descends. This intermittent operation continues until each of these four cartons has received a tenth biscuit from the last longitudinal row of dies, whereupon the four cartons are filled.

A single file of cartons is fed to the plunger 104 by conveyor apparatus including belts 111 and 112, best seen in Fig. 2. Cartons may be fed to the belt 111 manually or by any suitable automatic apparatus.

The belts 111 and 112 operate continuously whereby when the plunger 104 withdraws to the position illustrated in Fig. 8 cartons are advanced in front of the plunger 104 in position to be moved onto the platform 101 during the next forward stroke of the plunger. While the plunger 104 is in its forward position illustrated in Fig. 9, cartons 99, which normally fill the conveyor belt 112, are pressed against the side of the plunger 104 and are restrained from forward movement thereby. During this period the conveyor belt 112 continues to move and hence tends to advance cartons to fill any gaps therebetween.

Control apparatus 120 is provided for interrupting operation of the entire machine in the event that the supply of cartons fails. This apparatus is provided in order to prevent the depositing of biscuit dough on the platform 101 as would occur if the machine continued to operate following a failure of the supply of cartons. The control apparatus includes a feeler 121 for detecting the presence of cartons at a selected point on the conveyor belt 112. The feeler 121 is pivotally mounted on the frame of the machine by a pin 122, and spring means, not shown in the drawings, are employed for biasing the feeler lightly in a clockwise direction, or inwardly of the conveyor belt 112.

An arm 123 is also secured to the pin 122 and hence may be considered as a continuation of the feeler 121. The arm 123 passes close by an electrical switch 124 and extends into the path of a pin 125 mounted on the plunger 104.

Normally the presence of cartons 99 on the conveyor belt 112 maintains the feeler 121 in the position illustrated in Fig. 8. In this position the arm 123 mechanically contacts a button 126 on the electrical switch 124. Pressure of the arm 123 against this button maintains the switch 124 in such condition as to permit continued operation of the machine. However, in the event that

there are not cartons on the conveyor belt 112 adjacent the feeler 121 the feeler will swing inwardly of the conveyor belt under the influence of the spring means previously mentioned, whereupon the arm 123 will move away from the button 126. The switch 124 then moves into such a position that operation of the entire machine is interrupted.

Since the electrical control circuits permitting the switch 124 to control operation of the machine may be of any suitable form and since they do not of themselves constitute a feature of the invention they are not disclosed in the drawings or described herein. It is believed to be sufficient for the purposes of this disclosure to point out that the switch 124 opens or closes to interrupt or energize a control circuit which causes interruption of the operation of the machine when the arm 123 moves out of contact with the control button 126 of the switch 124.

Cartons for packaging biscuit dough are, for practical reasons, light in weight and tall relative to their diameters. Because of this they are easily toppled over and accordingly it is difficult to provide a feeler 121 which can detect or feel the cartons 99 while the latter are moving past the detector without the cartons being knocked over or damaged by the detector. At the same time, it is desirable that mechanical detecting means be employed because of its reliability and low cost. A solution to this problem is incorporated in the disclosed apparatus whereby the feeler 121 is permitted to contact the cartons 99 only when the cartons are stationary, that is when the plunger 104 has advanced to or toward the position illustrated in Fig. 9, under which conditions advancement of the cartons is blocked by the side of the plunger.

The pin 125 previously referred to is so positioned on the plunger 104 that when the plunger is withdrawn to the position illustrated in Fig. 8 the pin strikes the arm 123 and retains this arm and the detector 121 substantially in the position illustrated in Fig. 8. Under these conditions the arm 123 continues to contact the button 126 and the feeler 121 is maintained a very short distance away from the cartons on the conveyor belt 112. It is only while the plunger 104 is so withdrawn that the cartons on the conveyor 112 may advance, and during this period the feeler 121 is not in position to disturb the cartons or their advancement by the conveyor 112. When the plunger 104 again advances the pin 125 is withdrawn from contact with the arm 123 and the feeler 121 is free to contact the cartons 99, and if no cartons are located alongside the feeler the latter will swing in the clockwise direction and the arm 123 will be withdrawn from the button 126 to permit the switch 124 to interrupt operation of the machine.

The control apparatus disclosed provides mechanical means for interrupting the operation of the machine in the event that the supply of containers or cartons fails while at the same time preventing the possibility that such mechanical means will interfere with the progress of the cartons.

As the filled cartons reach the end of the platform 101 they are forced onto another conveyor 128 which carries the cartons away in single file. The conveyor 128 operates with a speed sufficient to carry four cartons away during the interval that the columns of cartons on the platform 101 are stationary. The cartons may be removed from the conveyor 128 manually or by any suitable automatic machinery.

Another control device is preferably employed at the outer edge of the conveyor 128 adjacent the area in which the cartons are thrust thereon from the platform 101. In Fig. 6 there may be seen a rail 129 at this point, the rail being spring biased toward the center of the machine by means not disclosed in the drawings. In the event that the conveyor 128 fails to remove the cartons delivered from the platform 101, the cartons will be forced against the rail 129 and move it outwardly of the ma-

chine. This in turn will cause interruption of the operation of the machine through control apparatus and control circuits not disclosed in the drawings. Since this control apparatus is optional and since it does not of itself form a feature of the invention it is not disclosed or described in detail herein.

It will be apparent that the invention may be varied in its physical embodiment without departing from the spirit of the invention, and it is desired, therefore, that the invention be limited only by the scope of the appended claims.

The invention having thus been described, what is claimed and desired to be secured by Letters Patents is:

1. In a machine for cutting sections from a continuous sheet of dough and depositing said sections in containers, a continuous die belt having a plurality of rows of substantially circular dies, the dies of adjacent rows being uniformly, longitudinally displaced with respect to each other, said die belt being adapted to support and intermittently to advance said dough, means for pressing such dough sheet simultaneously against a longitudinally extending portion of said die belt, plunger means arranged above said die belt for forcing severed sections of said dough downwardly through said die belt during intervals when said die belt is stationary, a plunger arranged to advance containers intermittently between successive positions beneath said die belt, in which positions said containers are adapted to receive said cut sections of said dough upon operation of said plunger means, said plunger being arranged to advance said containers under said die belt in a direction parallel to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies, and means for applying a film of oil to one side of at least all but one longitudinal row of said cut sections while still within said die belt whereby said sections may not stick together when placed in said containers; said pressing means comprising a continuous belt for pressing said dough into the individual dies of said die belt as said die belt advances said dough, a first roller over which said pressing belt passes, the axis of said roller being fixed, a second roller over which said pressing belt passes, means interconnecting said rollers for maintaining their axes in definite spaced-apart relationship, the axis of said second roller being arcuately movable about the axis of said first roller, said first roller being spaced a short distance from said die belt and said second roller being urged resiliently toward said die belt, and a third roller over which said pressing belt passes, said third roller being rotatably secured to said interconnecting means intermediate said first and second rollers and arcuately movable with said second roller about the axis of said first roller, said second and third rollers being so related that the portion of said pressing belt extending therebetween may be brought substantially simultaneously into contact with said dough sheet on said die belt; said oil applying means comprising, a plurality of reciprocating plungers arranged to contact the lower surface of cut sections of dough of at least all but one longitudinal row of said cut sections at one end of their strokes while said cut sections are in contact with said pressing belt, the phase relationship of said plungers and said die belt being such that said plungers may enter respective dies, contact respective cut sections, and withdraw from said dies between intermittent movements of said die belt, and means for applying oil to said plungers when said plungers are removed from said dies; and conveyor means for intermittently advancing empty containers to said plunger, said conveyor means and said plunger being alternately effective in advancing said containers, mechanical feeler means for detecting the presence of a container on said conveyor means at a fixed position, control means responsive to said feeler means for interrupting the intermittent operation of said plunger when no container is detected at said fixed position, and means responsive to said plunger for holding said feeler means away from said fixed position

tion during movement of said containers by said conveyor means.

2. In a machine for cutting sections from a continuous sheet of dough and depositing such sections in containers, a continuous die belt having a plurality of rows of substantially circular dies, the dies of adjacent rows being uniformly, longitudinally staggered with respect to each other, belt means for pressing such dough sheet simultaneously against a longitudinally extending portion of said die belt, means for removing from the die belt the sections of said dough so cut and placing them in containers, and means for applying a film of oil to one side of at least all but one longitudinal row of said cut sections while still within said die belt whereby said sections may not stick together when placed in said containers; said last-mentioned means comprising, a plurality of reciprocating plungers arranged to contact the lower surface of cut sections of dough of at least all but one longitudinal row of said cut sections at one end of their strokes while said cut sections are in contact with said belt means, the phase relationship of said plungers and said die belt being such that said plungers may enter respective dies, contact respective cut sections, and withdraw from said dies between intermittent movements of said die belt, and means for applying oil to said plungers when said plungers are removed from said dies.

3. In a machine for cutting sections from a continuous sheet of dough and depositing such sections in containers, a movable die belt adapted to support and intermittently to advance said dough, means for pressing such dough sheet against said die belt, means for removing from the die belt the sections of said dough so cut and placing them in containers, and means for applying a film of oil to one side of said cut sections while still within said die belt whereby said sections may not stick together when placed in said containers; said pressing means comprising a continuous belt for pressing said dough into the individual dies of said die belt as said die belt advances said dough, a first roller over which said pressing belt passes, the axis of said roller being fixed, a second roller over which said pressing belt passes, means interconnecting said rollers for maintaining their axes in definite spaced-apart relationship, the axis of said second roller being arcuately movable about the axis of said first roller, said first roller being spaced a short distance from said die means and said second roller being urged resiliently toward said die means, and a third roller over which said pressing belt passes, said third roller being rotatably secured to said interconnecting means intermediate said first and second rollers and arcuately movable with said second roller about the axis of said first roller, said second and third rollers being so related that the portion of said pressing belt extending therebetween may be brought substantially simultaneously into contact with said dough sheet on said die belt; said oil applying means comprising, a plurality of reciprocating plungers arranged to contact the lower surface of said cut sections at one end of their strokes while said cut sections are in contact with said pressing belt, the phase relationship of said plungers and said die belt being such that said plungers may enter respective dies, contact respective cut sections, and withdraw from said dies between intermittent movements of said die belt, and means for applying oil to said plungers when said plungers are removed from said dies.

4. In a machine for cutting sections from a continuous sheet of material and depositing said sections in containers, an intermittently movable continuous die belt, reciprocatory plunger means for driving severed sections of said sheet through said die belt, said plunger means entering individual dies of said die belt at one end of its stroke while said die belt is stationary and withdrawing at the other end of its stroke a sufficient distance away from said die belt to permit intermittent advancement of said die belt and continuous reciprocatory movement of said plungers without interference therebetween, and

conveyor means arranged to advance containers intermittently between successive positions beneath said die belt, in which positions said containers are adapted to receive said cut sections of said sheet upon operation of said plunger means, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, said conveyor means being arranged to advance said containers under said die belt in a direction parallel to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies, said plunger means having a plurality of individual plungers arranged in a transverse row parallel to the transverse direction of movement of said containers and to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies.

5. In a machine for cutting sections from a continuous sheet of material and depositing said sections in containers, an intermittently movable continuous die belt, plunger means arranged above said die belt for forcing severed sections of said sheet downwardly through said die belt during intervals when said die belt is stationary, conveyor means including a plunger arranged to advance containers intermittently between successive positions beneath said die belt, in which positions said containers are adapted to receive said cut sections of said sheet upon operation of said plunger means, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, said conveyor means being arranged to advance said containers under said die belt in a direction parallel to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies, said plunger means having a plurality of individual plungers arranged in a transverse row parallel to the transverse direction of movement of said containers and to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies, and feeder conveyor means for intermittently advancing empty containers to said plunger, said feeder conveyor means and said plunger being alternately effective in advancing said containers, mechanical feeler means for detecting the presence of a container on said feeder conveyor means at a fixed position, control means responsive to said feeler means for interrupting the intermittent operation of said plunger when no container is detected at said fixed position, and means responsive to said plunger for holding said feeler means away from said fixed position during movement of said containers by said feeder conveyor means.

6. In a machine for cutting sections from a continuous sheet of material, a continuous die belt comprising a plurality of die belt members extending generally laterally of said belt, said belt having a plurality of rows of substantially circular dies, the dies of alternate rows being uniformly longitudinally displaced with respect to each other, each transverse row of dies so formed, extending substantially laterally of said longitudinal rows, being mounted on a single die belt member, said members having undulating, nesting edges and being linked together to form said die belt.

7. In a machine for cutting sections from a continuous sheet of material and depositing said sections in containers, a continuous die belt, and conveyor means arranged to advance containers beneath said die belt to receive the cut sections of said sheet of material, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, and said conveyor means being arranged to advance said containers under said die belt along a line parallel to the aligned, angularly disposed rows of dies formed by the uniform displacement of said dies.

8. In a machine for cutting sections from a continuous sheet of dough and depositing said sections in containers, an intermittently movable continuous die belt, and con-

veyor means arranged to advance containers beneath said die belt with an intermittent motion to receive the cut sections of said sheet of dough when said die belt and said containers are stationary, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, and said conveyor means being arranged to advance said containers under said die belt along lines parallel to the aligned, angularly disposed rows of dies formed by the uniform displacement of said dies, said lines being spaced apart a distance equal to the spacing between adjacent ones of said transverse rows of dies, and said die belt being advanced during each intermittent movement thereof an integral number of transverse die rows equal to the number of said lines of containers.

9. In a machine for cutting sections from a continuous sheet of material and depositing said sections in containers, an intermittently movable continuous die belt, plunger means arranged above said die belt for forcing severed sections of said sheet downwardly through said die belt during intervals when said die belt is stationary, and conveyor means arranged to advance containers intermittently between successive positions beneath said die belt, in which positions said containers are adapted to receive said cut sections of said sheet upon operation of said plunger means, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, said conveyor means being arranged to advance said containers under said die belt in a direction parallel to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies, said plunger means having a plurality of individual plungers arranged in a transverse row parallel to the transverse direction of movement of said containers and to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies.

10. In a machine for cutting sections from a continuous sheet of material and depositing said sections in containers, an intermittently movable continuous die belt, plunger means arranged above said die belt for forcing severed sections of said sheet downwardly through said die belt during intervals when said die belt is stationary, and conveyor means arranged to advance containers intermittently between successive positions beneath said die belt, in which positions said containers are adapted to receive said cut sections of said sheet upon operation of said plunger means, said die belt having a plurality of rows of dies, the dies of adjacent rows being uniformly longitudinally displaced with respect to each other, said conveyor means being arranged to advance said containers under said die belt in longitudinal files parallel to the aligned, angularly disposed rows of dies formed by the uniform displacement of said dies and in rows parallel to the longitudinal rows of said dies, said plunger means having a plurality of individual plungers arranged in longitudinal rows parallel to the longitudinal rows of dies and in transverse rows parallel to the transverse direction of movement of said containers and to the aligned, angularly disposed rows of dies formed by said uniform displacement of said dies.

11. In a carton handling machine, conveyor means for intermittently advancing cartons to a station at which an operation is to be performed intermittently on said cartons, mechanical means for detecting the presence of a carton on said conveyor means at a position fixed with respect to said station, control means responsive to said detecting means for interrupting said operation on said cartons at said station when no carton is detected in said fixed position, and means for driving said detecting means away from said fixed position prior to each intermittent movement of said cartons by said conveyor means and for holding said detecting means away from said fixed position during such movement of said cartons.

12. In a carton handling machine, conveyor means

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for intermittently advancing cartons to a station, apparatus for intermittently performing an operation on said cartons at said station, mechanical feeler means for detecting the presence of a carton on said conveyor means at a position fixed with respect to said station, control means responsive to said detecting means for interrupting operation of said apparatus when said detector means detects no carton in said fixed position, and means actuated by said apparatus for holding said detector means away from said fixed position during movement of said cartons by said conveyor means.

13. In a carton handling machine, conveyor means for intermittently advancing empty cartons to a station, plunger means for intermittently advancing cartons away from said station, said conveyor means and said plunger means being alternately effective in advancing said cartons, mechanical feeler means for detecting the presence of a carton on said conveyor means at a position fixed with respect to said station, control means responsive to said feeler means for interrupting the intermittent operation of said plunger means when no carton is detected at said fixed position, and means responsive to said plunger means for holding said feeler means away from said fixed position during movement of said cartons by said conveyor means.

14. In a carton handling machine having conveyor means for advancing cartons to a station and plunger means for intermittently advancing said cartons away from said station, such conveyor means being effective to advance said cartons toward said station only when said plunger means is withdrawn preparatory to a carton advancing stroke; mechanical means for detecting the presence of a carton on such conveyor means at a position fixed with respect to said station, said detecting means being movable into and out of a carton detecting position, means interconnecting said detecting means and such plunger means for controlling the position of said detecting means whereby said detecting means is held in said detecting position during a carton advancing stroke of said plunger and whereby said detecting means is held away from detecting position when said plunger means is withdrawn preparatory to a carton advancing stroke, and control means responsive to said carton detecting means for terminating operation of said plunger means when said detector means detects no carton at said fixed position.

15. In a machine for cutting sections from a continuous sheet of dough, a movable die belt adapted to support and to advance said dough, a continuous belt for pressing said dough into the individual dies of said die belt as said die belt advances said dough, and a pair of rollers over which said pressing belt passes, said first roller being spaced a short distance from said die belt and said second roller being so positioned as to cause said pressing belt substantially to contact said die belt as said pressing belt passes between said second roller and said die belt.

16. In a machine for cutting sections from a continuous sheet of dough, a movable die belt adapted to support and advance said dough, a continuous belt for pressing said dough into the individual dies of said die belt as said die belt advances said dough, a first roller over which said pressing belt passes, the axis of said roller being fixed, a second roller over which said pressing belt passes, means interconnecting said rollers for maintaining their axes in definite spaced-apart relationship, and a third roller over which said pressing belt passes, said third roller being arranged intermediate said first and second rollers, said first roller being spaced a short distance from said die means, and said second and third rollers being so positioned as to cause the portion of said pressing belt extending therebetween substantially to contact said die belt.

17. In a machine for cutting sections from a continuous sheet of dough, a movable die belt adapted to sup-

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port and advance said dough, a continuous belt for pressing said dough into the individual dies of said die belt as said die belt advances said dough, a first roller over which said pressing belt passes, the axis of said roller being fixed, a second roller over which said pressing belt passes, means interconnecting said rollers for maintaining their axes in definite spaced-apart relationship, the axis of said second roller lying in the same plane as and being arcuately movable about the axis of said first roller, said first roller being spaced a short distance from said die means and said second roller being adjustably positionable toward and away from said die means, and a third roller over which said pressing belt passes, said third roller being rotatably and adjustably secured to said interconnecting means intermediate said first and second rollers and arcuately movable with said second roller about the axis of said first roller, the axis of said third roller being adjustable with respect to said interconnecting means in a direction perpendicular to a plane containing the axes of said first and second rollers whereby the portion of said second-mentioned belt extending between said second and third rollers may be brought substantially simultaneously into contact with said dough sheet on said die belt.

18. In a machine for cutting sections from a continuous sheet of dough and depositing such sections in containers, an intermittently advancing die belt, means for pressing such dough sheet against said die belt, means for removing from the die belt the sections of said dough so cut and placing them in containers, and means for applying a film of oil to one side of said cut sections while still within said die belt whereby said sections may not stick together when placed in said containers; said last-mentioned means comprising, a plurality of reciprocating plungers arranged to contact the lower surface of said cut sections at one end of their strokes, the phase relationship of said plungers and said die belt being such that said plungers may enter respective dies, contact respective cut sections, and withdraw from said dies between intermittent movements of said die belt, and means for applying oil to said plungers when said plungers are removed from said dies.

19. In a machine for cutting sections from a continuous sheet of dough and depositing such sections in containers, an intermittently advancing die belt having longitudinal and transverse rows of dies, continuously operable means for pressing such dough sheet simultaneously against a plurality of transverse rows of said die belt, means for removing from the die belt the sections of said dough so cut and placing them in containers, and means for applying a film of oil to one side of said cut sections while still within said die belt whereby said sections may not stick together when placed in said containers; said last-mentioned means comprising, a plurality of reciprocating plungers arranged to contact the lower surface of said cut sections at one end of their strokes while said cut sections are in contact with said pressing means, the phase relationship of said plungers and said die belt being such that said plungers may enter respective dies, contact respective cut sections, and withdraw from said dies between intermittent movements of said die belt, and means for applying oil to said plungers when said plungers are removed from said dies.

20. In a machine for cutting sections from a continuous sheet of material, a continuous die belt adapted to support and intermittently advance said sheet, means for pressing said sheet into the individual dies of said die belt, plunger means for driving the cut sections of said sheet through said individual dies, and means for driving said plungers in simple harmonic motion, said plunger means entering individual dies of said die belt at one end of its stroke while said die belt is stationary and withdrawing at the other end of its stroke a sufficient distance away from said die belt to permit intermittent advancement of said die belt and simple harmonic move-

ment of said plungers without interference therebetween.

21. In a machine for cutting sections from a sheet of material and depositing said sections in containers, a die belt, and a conveyor means adapted to support a plurality of generally cylindrical containers beneath said die belt to receive the cut sections of said sheet of material, said die belt having a plurality of dies uniformly spaced in generally longitudinal and transverse rows, with said transverse rows at an angle of approximately 60° relative to said longitudinal rows, and said conveyor means being arranged parallel to said transverse rows of dies,

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so that cylindrical containers of uniform size may be positioned on said conveyor in line beneath said dies, with said containers fully nested together.

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