Sept. 25, 1956 J. W. FAY ET AL 2,764,070

MACHINE FOR FORMING BLANKS OF CARDBOARD AND THE LIKE.

Filed April 13, 1954 4 Sheets-Sheet 1

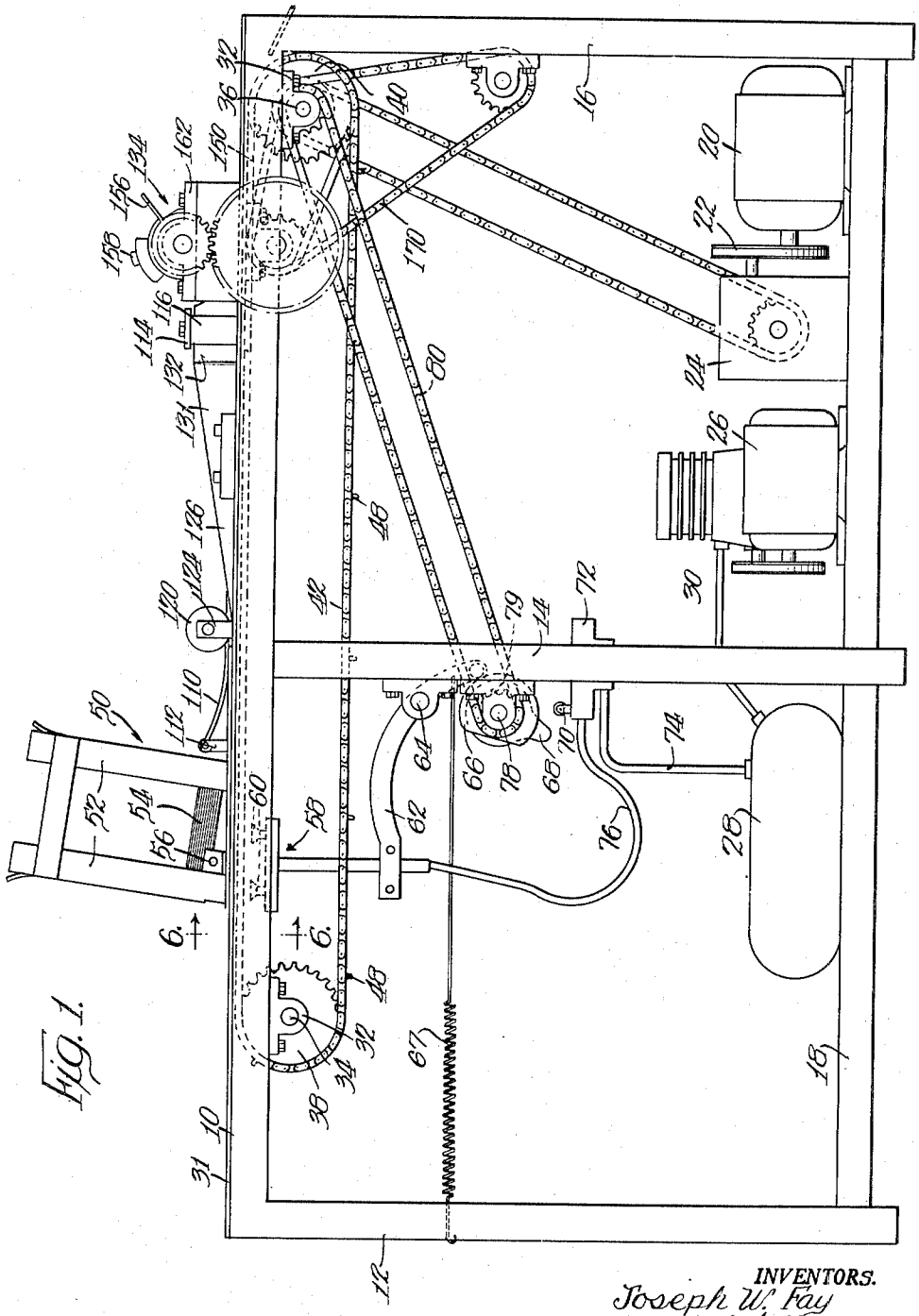

Fig. 1.

INVENTORS.
Joseph W. Fay
BY Rudolph T. Fay
Kegan and Kipnis
Attys.

Sept. 25, 1956 J. W. FAY ET AL 2,764,070

MACHINE FOR FORMING BLANKS OF CARDBOARD AND THE LIKE

Filed April 13, 1954

4 Sheets-Sheet 2

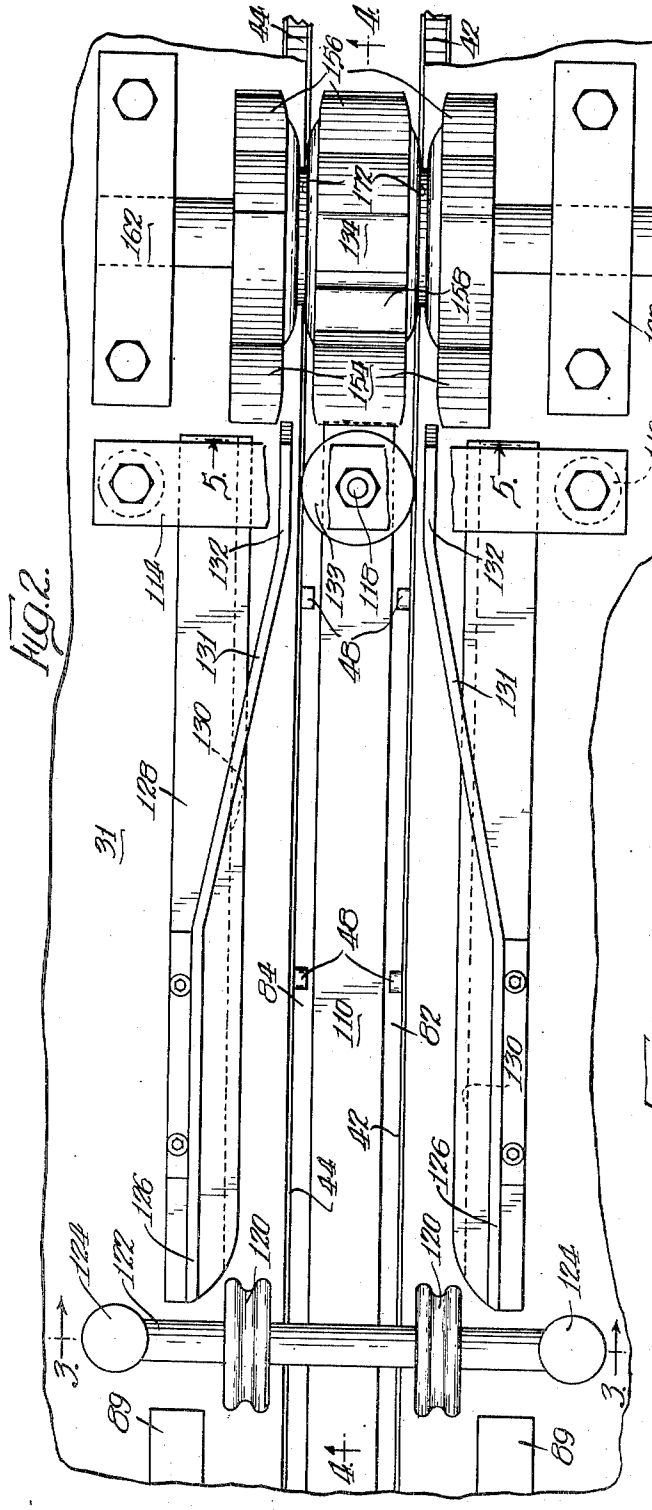

Fig. 2.

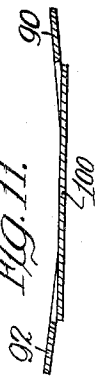

Fig. 11.

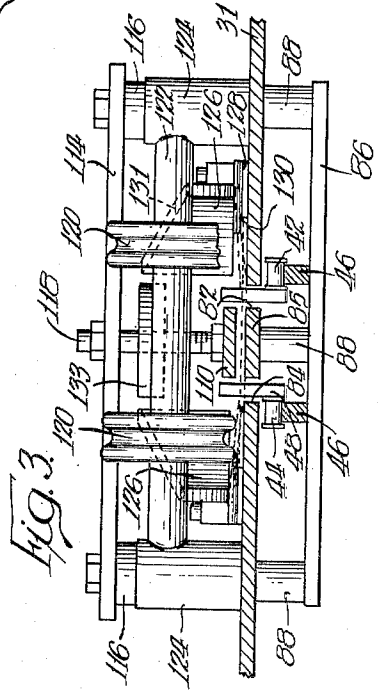

Fig. 3.

INVENTORS.
Joseph W. Fay
BY Rudolph J. Fay
Kegan and Kipnis
Attys.

Sept. 25, 1956 J. W. FAY ET AL 2,764,070

MACHINE FOR FORMING BLANKS OF CARDBOARD AND THE LIKE.

Filed April 13, 1954

4 Sheets-Sheet 3

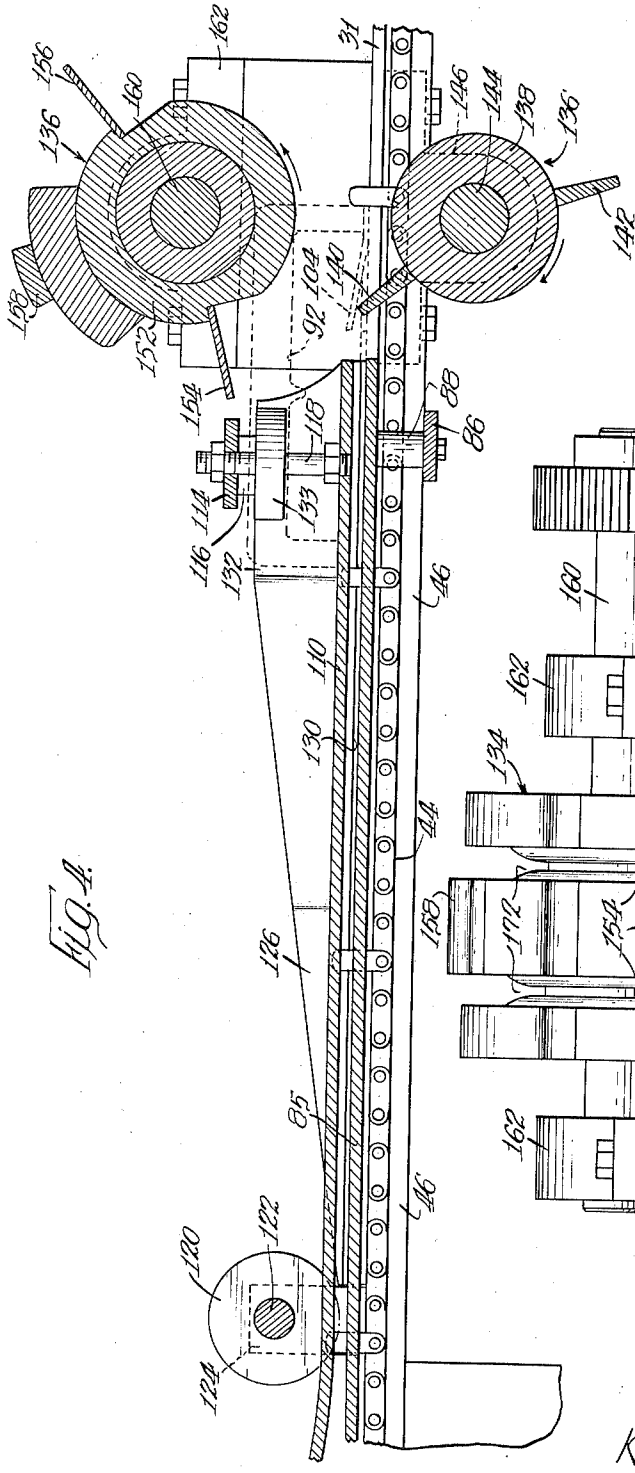

Fig. 4.

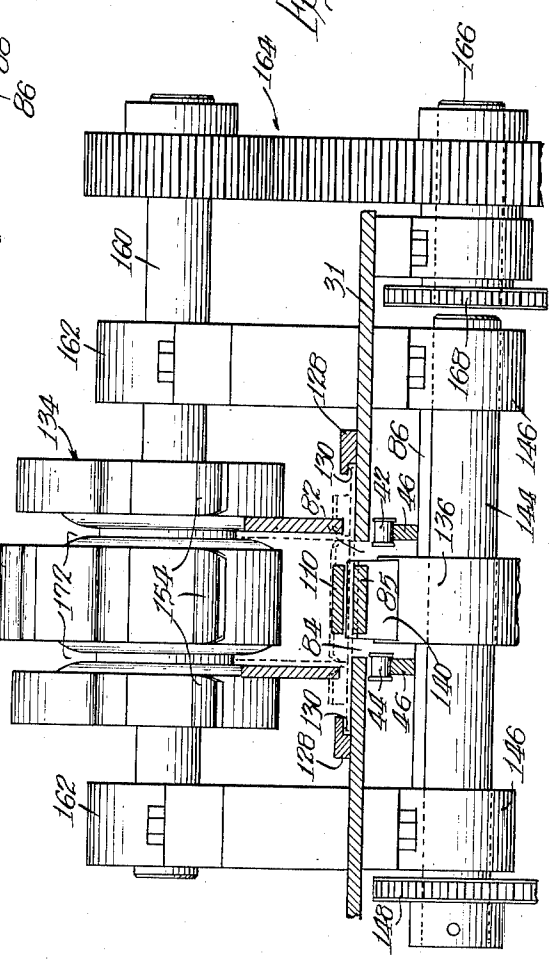

Fig. 5.

INVENTORS.
Joseph W. Fay
BY Rudolph S. Fay
Kegan and Kipnis
Attys.

Sept. 25, 1956 J. W. FAY ET AL 2,764,070

MACHINE FOR FORMING BLANKS OF CARDBOARD AND THE LIKE

Filed April 13, 1954

4 Sheets-Sheet 4

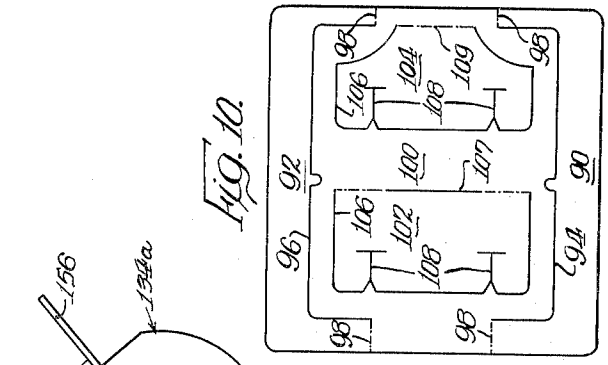

Fig. 10.

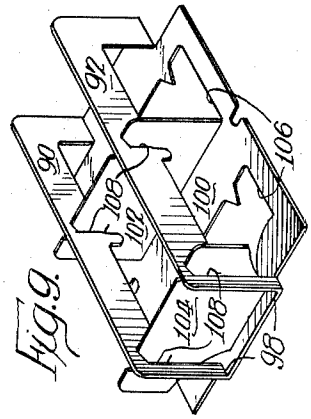

Fig. 9.

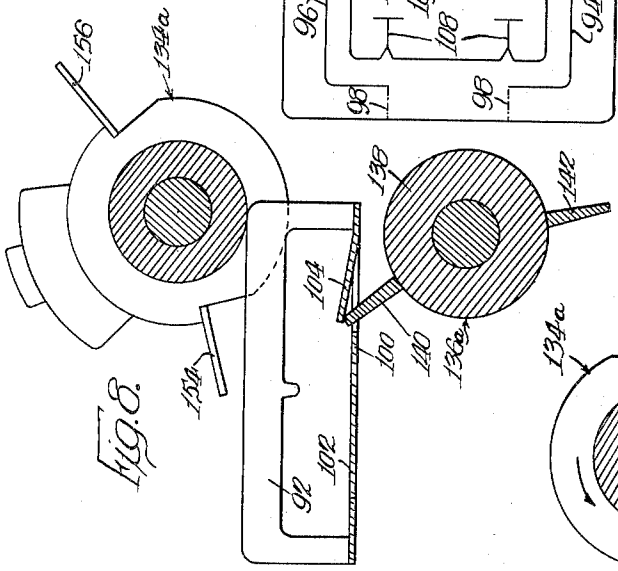

Fig. 8.

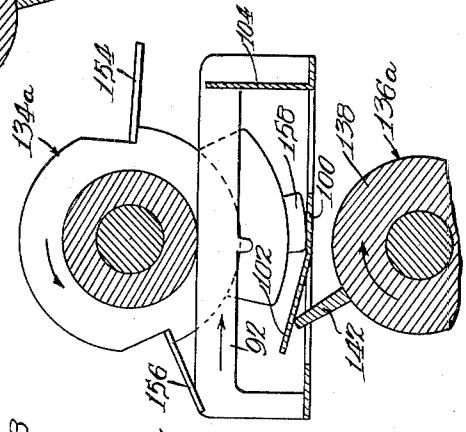

Fig. 7.

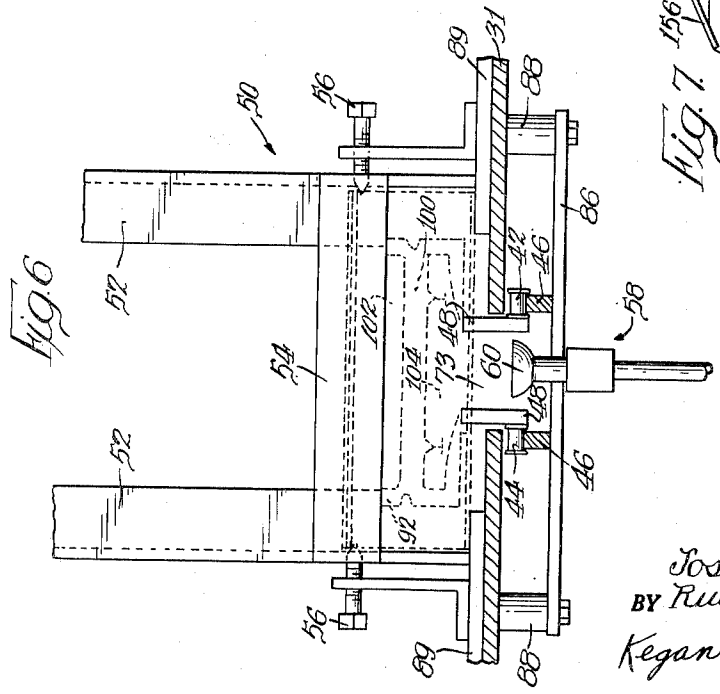

Fig 6

INVENTORS.
Joseph W. Fay
BY Rudolph J. Fay
Kegan and Kipnis
Attys

United States Patent Office 2,764,070 Patented Sept. 25, 1956

2,764,070

MACHINE FOR FORMING BLANKS OF CARDBOARD AND THE LIKE

Joseph W. Fay and Rudolph J. Fay, Villa Park, Ill., assignors to Schulze and Burch Biscuit Co., Chicago, Ill.

Application April 13, 1954, Serial No. 422,737

7 Claims. (Cl. 93—37)

This invention relates to machines and methods for forming articles of cardboard and similar materials from perforated and scored blanks, and more specifically to a machine and method for forming partitioned trays from appropriately perforated and scored blanks.

It is common practice in a number of packaging applications, and most particularly in the packaging of bakery goods such as cookies, to separate individual items in the package by partitions of cardboard or similar material, the partitions and the cookies or other goods being enclosed in a wrapper, which is frequently of transparent material. In one frequently used type of structure, the partitions are all formed from a single integral blank, the longitudinal and transverse partitions being bent substantially perpendicular with the body of the blank, and being inter-engaged to lock the structure into the form of a unitary partitioned tray. In forming one type of such tray from a perforated and scored blank, the longitudinal partitions are formed by bending longitudinal portions of the blank away from the blank along lines scored for this purpose, and the transverse partitions are also formed by bending them from the body of the blank, suitable interlocking means being provided, such as slots in the transverse partitions cooperating with protrusions on the longitudinal partitions. One type of such partitioned tray is described hereinafter in greater detail in connection with an illustrated embodiment of the present invention, which lies in a machine and method for performing the various operations required in the forming of partitioned trays and similar articles from flat blanks.

There are, of course, a large variety of machines available for the folding and forming of cardboard blanks, particularly in the making of boxes and other packaging assemblies. In some cases these machines may, by slight modification, be made to form blanks similar to those with which the present invention is concerned. However, it is found that those of the machines heretofore available which can be modified or combined for the present purposes are relatively expensive, slow, and difficult to adjust, while the inexpensive, speedy, and rugged machines heretofore devised for the forming of articles from flat blanks are not suitable for forming partitioned trays of the type described above.

It is accordingly the principal object of the present invention to provide a machine which is relatively inexpensive and simple to construct and operate, while at the same time being capable of fast and efficient production of finished assemblies of partitioned trays of the above-discussed type.

It is well known that in machines for the forming of cardboard blanks, as in machines for many other purposes, the employment of rotating, rather than reciprocating, implements for forming and otherwise working upon the work-pieces greatly increases the speeds at which the work-pieces may be processed, thus greatly increasing the production rate of any given number of machines and reducing both the capital investment and the expense of producing the finally formed product. It is accordingly a subsidiary object of the invention to provide a machine of suitably low cost employing, to the maximum extent possible, unidirectionally rotating, rather than reciprocating, moving parts; the machine nevertheless being able to perform in an efficient manner the operations required for the forming of blanks of the type discussed above.

In another aspect, it is the object of the invention to provide an automatic machine for performing the various folding operations required with a minimum number of parts, each part being of minimum intricacy and maximum simplicity.

In achieving the above objects, there has been devised a new method of forming the blanks, the method being particularly well adapted for automatic machinery, but also being suitable for manual forming of blanks with conventional tools or machines.

The objects briefly stated above are of course merely an expression of the motivation and background of the invention, and do not constitute a complete statement of all of the advantages which flow from the invention. For a complete understanding of the invention, and of the advantages which flow therefrom, reference is made to the embodiments of the invention which have been selected for illustration in the appended drawing, and which are described below, in accordance with the patent statutes.

In the drawing:

Figure 1 is a view in side elevation of a machine for forming blanks from cardboard and like materials, made in accordance with the invention;

Figure 2 is a plan view in elevation of a portion of the machine illustrated in Figure 1;

Figure 3 is a fragmentary transverse, vertical sectional view taken along the line 3—3 of Figure 2;

Figure 4 is a longitudinal, vertical sectional view taken along the line 4—4 of Figure 2 in the direction indicated by arrows;

Figure 5 is a transverse, vertical sectional view taken along the line 5—5 of Figure 2 in the direction indicated by arrows;

Figure 6 is a fragmentary, vertical sectional view taken along the line 6—6 of Figure 1 illustrating a portion of the feed mechanism constituting a part of the machine;

Figure 7 is a fragmentary, vertical sectional view corresponding to a portion of Figure 4, but illustrating the parts in a different portion of the cycle of operation of the machine;

Figure 8 is a view similar to Figure 7, but illustrating a modification of the machine shown in Figures 1 through 7;

Figure 9 is a view in perspective of a partitioned tray produced by the machine of the invention;

Figure 10 is a plan view of a flat cardboard blank from which the machine operates to form the device of Figure 9; and

Figure 11 is a fragmentary portion of Figure 3, with a blank shown in section to clarify a portion of the operations performed thereon.

Referring first to Figure 1, it will be seen that the machine is mounted on a frame or support comprising a top frame **10** supported by front, center, and rear legs **12**, **14** and **16**, respectively. The frame is completed by a tray or shelf **18** at the bottom, upon which are supported a motor **20** coupled by gears **22** to a gear-reduction box **24**, and a motor-driven vacuum compressor **26** connected to a vacuum tank **28** by a tube **30**. To the top frame **10** is secured a table plate **31**.

Journaled in pillow blocks **32** affixed to the under edge of the top frame **10** are shafts **34** and **36** at opposite ends of the machine, upon which are mounted front sprocket wheels **38** and rear sprocket wheels **40** which constitute

the support and drive for two laterally spaced sprocket conveyor chains **42** and **44**. Sagging of the conveyor chains **42** and **44** along their working (upper) path is prevented by longitudinal support bars **46**. Secured at equal intervals on the chains **42** and **44** and extending therefrom are lugs or stops **48**, the intervals between lugs or stops **48** being selected to correspond exactly with the length of a flat blank which the machine is designed to form, so that the lugs **48** on the two chains confine the work-piece against forward or rearward longitudinal motion with respect to the chains.

The chains **42** and **44** serve as a conveyor transporting the work-pieces through the assemblies for performing the various required operations thereon. For convenience and simplicity in understanding the functioning of the machine, and the nature and advantages of the invention, the portions of the machine not heretofore described will be divided into assemblies designated respectively: The Feed Assembly, The Breaking Assembly, The Rail-Forming Assembly, and The Partition-Forming Assembly; and the overall synchronization of the various assemblies and their joint mode of operation as a unitary device will thereupon be readily understood.

The feed assembly

Mounted atop the table plate **31** on the forward portion of the machine is a magazine generally designated by the numeral **50**, which comprises four corner angles **52** defining a rectangular chute in which is deposited a stack **54** of work-pieces (flat cardboard blanks, appropriately perforated and scored), the stack being slightly tilted toward the rear by reason of the fact that the forward edge of the stack is supported at the corners by screw pins **56**. Beneath the magazine **50** is a vacuum cup assembly generally designated **58** and including vacuum cups **60**, supported on a lever arm **62**, which is pivoted on the frame at **64** and is cycled by a cam **66**, being biased by a conventional tension spring. Rotatable with the cam **66** is an additional cam **68** actuating the trip lever **70** of a three-way valve **72**. The valve **72** connects the vacuum cups **60** to a conduit **74** leading to the tank **28** when the trip lever **70** is actuated, but otherwise connects the vacuum cups **60** to the atmosphere, the connection from the valve **72** to the vacuum cups **60** being effected by a flexible tube **76**.

The cams **66** and **68** are mounted on, and driven by, a shaft **78**, which is driven by a sprocket wheel **79** and sprocket chain **80** from the shaft **36**, which serves as the jackshaft or main shaft driving and synchronizing the various parts of the machine. The chain **80** drives the cams **66** and **68** at the same rotational speed as the sprocket wheel **40**. The spacing between stops **48** is equal to one-half the circumference of the sprocket wheel **40**, so that the cams **66** and **68** go through one cycle for each two stops **48** passing beneath the magazine **50**. The phasing of the cams **66** and **68** with respect to each other and to the chains **42** and **44** is such that the cycle of motion of the lever arm **62** and actuation of the valve **72** acts to raise the cups **60** against the bottom-most blank in the stack **54** and withdraw it by means of the vacuum, which is sufficient to slightly bend the corners of the blank sufficiently so that the blank is drawn past the screw pins **56**. The vacuum is released as the blank is deposited on the table **31** between adjacent stops **48**, which protrude through a longitudinal slot **73** in the table. Thus each alternate pair of stops **48** pushes along the table **31** a single blank to be formed by the following assemblies. It will be noted that the stops **48** have rounded ends to permit them to slide under the rearward portions of the stack of blanks in the magazine **50**. The rearward portion of the slot **73** is divided into two slots **82** and **84**; the portion **85** of the table plate **31** between the slots **82** and **84** being supported by straps **86** suspended from the underside of the table **31** by posts **88**; the straps **86** also serve to support the support bars **46** which guide the chains. As the blanks pass from beneath the magazine **50**, they do not slide directly on the table **31**, but are slightly elevated (Figure 6) with respect to the table **31** by flat plates **89** extending longitudinally at the sides so as to support only the outer edges of the blanks.

The breaking assembly

In order to facilitate understanding of the operation of the forming apparatus to be described, it is desirable to first describe a type of blank which the machine is suited to form. Referring to Figure 10, it will be seen that the blank is a generally rectangular sheet of cardboard or similar material perforated and scored as follows: The lateral edges of the blank constitute rail portions **90** and **92** formed by U-shaped perforations **94** and **96**, the inner ends of the legs or support portions of which are connected by scoring **98** to the front and rear edges of the blank. It will be seen that the rail portions **90** and **92** may be bent away from the body **100** of the blank, and constitute, when perpendicular to the body **100**, spaced rail portions extending longitudinally of the body portion and parallel therewith, having support portions perpendicular to the body **100**. Inwardly of the rail portions **90** and **92** are transverse partition portions **102** and **104**. The partition portions **102** and **104** are formed by through perforations on three sides, the fourth side constituting transverse scoring at **107** and **109**. It will be understood that the term "perforated" as herein used refers to the fact that the perforation or cutting is sufficiently complete so that a break may easily be made along the line thereof, while the term "scored" indicates that the body of the blank is indented or otherwise treated to define a line along which a fold or bend may easily be made, without separation or breaking along such line. The partition portions **102** and **104** are slitted at **108**, the slits **108** being in alignment with the scoring **98**. Thus when the partitions **102** and **104** are erected to the perpendicular position after the rail portions **90** and **92** have so been erected, the rail portions **90** and **92** are engaged in the slits **108** to interlock the entire assembly and form a partitioned tray as shown in Figure 9.

The blanks are fed from the magazine **50** in such orientation that the leading edge of each of the partitions **102** and **104** is the edge **107** or **109** which is scored for folding or bending, rather than the edge which is perforated for breaking. Thus both of the partition portions **102** and **104** may be described as "trailing" partitions, since they proceed through the machine led by the edge which remains connected to the body of the blank.

A short distance rearward of the magazine **50** the blanks pass beneath a hold-down strip **110** which commences at the rear of the magazine **50** and extends toward the rear of the machine, all but the forwardmost portion being closely above the portion **85** of the table plate **31** between the slots **82** and **84**. The hold-down plate **110** is supported in this position at the forward end of the machine by side posts **112** and near the rearward end by a strap **114** supported by posts **116**, a bolt **118** connecting the strap **114** and the hold-down plate or strip **110**. Just beyond the ends of the longitudinal plates or bars **89**, which support the edges of the blanks as they pass from under the magazine **50**, as described above, are a pair of rollers or wheels **120** idling on a shaft **122** supported above the table plate by posts **124**. The rollers **120** are so placed as to hold down the body of the blank **100** just inward of the longitudinal partition portions **90** and **92** (Figure 11). The diameters of the hold-down wheels or rollers **120** are such as to hold the body **100** of the blank substantially flush against the table plate **31**. Extending rearwardly from points spaced laterally outwardly from the rollers **120** are inclined or tapered rails or tracks **126** onto which the leading edges of the rail portions **90** and **92** of the blank slide as the blank passes beneath the rollers **120**. The rails **126** are mounted on long bars **128** which rest on the table plate **31** and are undercut at **130**. As each blank passes under the rollers **120**, therefore, the

lateral edges of the body portion (inward of the rail portions **90** and **92**) are engaged under the undercut portions of the bars **128** while the rail portions **90** and **92** of the blank slide along the tapered rails **126**, which thus bend and break the rail portions **90** and **92** away from the body **100** and commence to erect the rail portions **90** and **92**, the line of bending away of these rail portions being defined by the cooperation of the hold-down plate **110** and the scoring **98**. Thus at the breaking assembly, the rail portions are broken away from the body of the blank in an upward direction, and the erection of the rail portions is commenced.

The rail-forming assembly

The rearward portions of the rails **126**, in addition to being upwardly inclined or tapered to gradually increasing height, are formed to converge at **131**, the rearmost portions **132** of the rails **126** again being parallel, the spacing between them corresponding substantially to the spacing between the perforations **98** on the blank so that in this rearmost or final portion of the rails **126**, the rail portions **92** and **90** are held substantially perpendicular to the body **100** of the blank, which is restrained by the hold-down plate **110**, the lateral edges of the body portion of the blank still being beneath the undercut **130** in each of the side bars **128**. A guide wheel **133** on the bolt **118** aids in maintaining the rail portions perpendicular to the body portion of the blank. It will thus be seen that the breaking away of the rail portions **90** and **92** in the breaking assembly by the breaking wheels or rollers **120** and the rails **126**, which serve as fulcrum members, is followed in the rail-forming assembly by the erection of the rail portions to positions perpendicular to the body, in which condition the partially formed blank enters the partition-forming assembly now to be described.

The partition-forming assembly

Immediately rearward of the rail-forming assembly described above is the partition-forming assembly, which generally comprises an upper paddle wheel **134** and a lower paddle wheel **136**, the lower paddle wheel being constructed and arranged to break the partition portions **102** and **104** of the blank loose from the body portion **100** and bend them partly upward, and the upper paddle wheel **134** being constructed and arranged to erect the partition portions **102** and **104** to a position perpendicular to the body portion **100** and engage them with the rail portions **90** and **92**. The lower paddle wheel **136** consists generally of a hub **138** upon which is mounted a pair of angularly related radial paddles **140** and **142**. The hub **138** is affixed to a shaft **144** which is journaled in pillow blocks **146** affixed to the underside of the table plate **31** and is driven by a sprocket wheel **148** which is coupled to a sprocket chain **150** to the jackshaft or main shaft **36**. The relative sizes of the sprocket wheel **148** and the corresponding sprocket wheel on the shaft **36** are such that the lower paddle wheel rotates twice for each full rotation of the shaft **36**, or, in other words, the lower paddle wheel **136** goes through one cycle of rotation each time it is passed by one pair of stops **48**.

The upper paddle wheel **134** has a pair of radial paddles **154** and **156** in essentially the same angular relation on the hub **152** of the upper paddle wheel **134** as the angular relation of the paddles **140** and **142** of the lower paddle wheel **136**. In addition, between the paddles **154** and **156**, the paddle wheel **134** has a radially protruding hold-down protrusion or shoe **158** of an overall radius such that it passes almost, but not quite, tangent to the table plate **31**, thus being radially shorter than the paddles **152** and **154**. The paddle wheel **134** is mounted on a shaft **160** journaled in pillow blocks **162** above the table plate **31** and is geared at **164** to a shaft **166** which is driven by a sprocket wheel **168** and sprocket chain **170**, the latter being driven by the jackshaft **36** to drive the shaft **166** at a one-to-one ratio, the gearing **164** stepping up the speed of the shaft **160** to two-to-one, so that the upper paddle wheel and the lower paddle wheel rotate at the same speed.

The phasing of the paddles on the respective paddle wheels (i. e., the sequence in which the paddles pass through the region between the rotating shafts to operate on the work-piece) is such that each partition **102** and **104** is struck first from beneath by a paddle on the lower wheel to break the partition away from the body of the blank and then is engaged at the edge by a paddle of the upper paddle wheel to complete the perpendicular bending of the partition with respect to the body of the blank. Thus the partition **104** is struck from beneath by the paddle **140** (Figure 4) and, while still held partially erected by the paddle **140**, is struck at the trailing edge by the paddle **154**, which completes the perpendicular bending of the partition **104** and interengages the slits **108** of the partition **104** with the rail portions **90** and **92**. The forming of the partition **102** (Figure 7) is carried out in similar fashion.

The upper paddle wheel **134** is circumferentially grooved at **172**, the grooves **172** serving to pass the upstanding rail portions **90** and **92**, and also to hold them in proper position as the partition portions **102** and **104** are bent upward, and additionally to hold down the blank against the upward force of the paddles on the lower paddle wheel **136** to permit proper upward bending of the respective partitions by the paddles on the lower wheels. As seen in Figure 7, this holding-down action is also aided by the hold-down shoe **158** as the partition **102** is bent upward by the paddle **142** prior to completion of the perpendicular bend by the upper paddle **156**.

It will be noted that completion of the upward bend by the paddles **154** and **156** of the upper paddle wheel **134** requires that the peripheral speed of the ends of the paddles **154** and **156** must be greater than the linear speed of the conveyor chains, in order that the folding or bending may be completed by striking of the trailing edge of each partition. On the other hand, the paddles **154** and **156**, respectively, must, after the partitions are perpendicular, be retarded in the direction of motion of the conveyor chain, otherwise the assembly being formed will be damaged or destroyed. The relation between the constant rotational motion of the paddles and the linear motion of the conveyor produces the desired speed relation. The overall length or radius of rotation of the upper paddles, when combined with the gear ratio between the conveyor chain and the shaft on which the upper paddles are mounted, produces a linear speed at the outer ends of the paddles **154** and **156** which is greater than the speed of motion of the conveyor chains. The critical factor in obtaining proper bending or folding action without damage to the work-pieces is the component of the speed of the outer ends of the paddles along the direction of motion of the conveyor. The relative motion of the end of the paddle with respect to the conveyor and the work-pieces varies sinusoidally as the paddle goes through its rotational path, the speed of the paddle in the direction of motion of the conveyor being at its maximum when the paddle is perpendicular to the conveyor and thereafter diminishing to zero as the paddle rotates ninety degrees to the point where it is parallel with the conveyor. This fact is utilized in the illustrated machine to make the uniformly rotating upper paddles complete the perpendicular bending of the partitions without breaking or damaging the blanks or the forms made from the blanks. Pressure will continue to be exerted by the upper paddle on the partition until the component of the speed of the end of the paddle in the direction of motion of the conveyor is less than the speed of the conveyor itself. Thus there is no hazard of breaking or damaging the workpieces if the phasing of the paddle rotation with respect to the stops **48** is such that the earlier portion of the contact of the paddle with the partition is made with the maximum

speed of the paddle with respect to the conveyor; as the paddle sweeps through the point where its path is closest to the conveyor, its speed with respect to the conveyor is maximum, and the bending action on the partition is greatest. Thereafter, the component of motion of the end of the paddle in the direction of the conveyor diminishes and ultimately, when the bend is completed, the paddle commences to lag behind the conveyor. Alternatively, it would of course be possible to so design the device that the paddle clears the upper end of the partition just as the bend is completed, with the paddle still traveling as fast in the direction of the conveyor as the conveyor itself, but such operation requires more exact adjustment and synchronization of the parts. In either event, the relative slowing of the paddle end with respect to the workpiece as the paddle passes through the point of being perpendicular to the conveyor is of great assistance in diminishing the precision of adjustment required in order to accomplish proper bending or folding action without damaging the work-piece, particularly where the upwardly bent partition is locked into place upon completion of the bend, as in the present embodiment of the invention.

It will be seen that the method of completing the forming of the partition described above is not necessarily restricted to automatic forming machinery, but may readily be adapted to manual forming of blanks with conventional tools and equipment.

Thus the completed blank leaves the partition-forming assembly in its ultimate form as a partitioned tray as shown in perspective in Figure 9, the tray having six mutually partitioned receptacles, the enclosure of the outer or peripheral receptacles being completed by the subsequent insertion of the tray into a bag or box into which it is inserted after filling.

In Figure 8 is shown an alternative construction of the partition-forming assembly in which the lower paddle wheel, designated **136***a*, rather than being directly opposite the upper paddle wheel **134***a*, is located slightly forward of the upper paddle wheel, thus reducing the region of overlap of the strokes of the paddles of the respective paddle wheels, and making even less critical the phasing of the paddle wheels, and thus reducing the accuracy of synchronization required to prevent the paddles of the respective wheels colliding and damaging the machine. Other modifications and alterations of the embodiment of the invention illustrated will be apparent. For example, it will be seen that by suitable modification the direction of the lower paddle wheel may be reversed so that both wheels are rotating in the same direction, since proper operation of the device restricts only the direction of rotation of the upper paddle, it being a suitable mode of operation to break the partitions away from the body of the blank by rotation of the lower paddle in the direction opposite to that shown, with suitable modification of the paddle length to prevent collision of the paddles.

In addition to such relatively small modifications of the illustrated embodiment as those discussed above, it will be seen that the teachings of the invention may be employed in the construction of machines far different both in appearance and in detailed nature of the operations performed by the machine, and for the formation of blanks which differ from the blanks for use with which the illustrated embodiment is designed. Since the teachings of the invention may be applied in manners greatly different from the exact manner shown in the embodiment illustrated, the scope of the protection afforded the invention should not be in any way limited by the particular embodiment shown, but should be determined only from the appended claims.

What is claimed is:

1. A machine for forming, from flat blanks, partitioned trays of the type comprising a body portion, spaced rail portions extending longitudinally of the body portion and parallel therewith, said rail portions having support portions perpendicular to the body portion, and transverse portions perpendicular to the body portion and interlocked with the rail portions, said machine comprising, in combination, a pair of elongated laterally spaced conveyor chains having means for maintaining the position of successive blanks thereon, means for loading single successive blanks onto the conveyor chains, a breaking assembly spaced from the loading means along the path of the conveyor chains comprising a pair of oppositely disposed breaking wheels adapted to press on the central portion of the blanks and a pair of fulcrum members laterally spaced from the wheels and adapted to support the rail portion edges of the blanks, a rail-forming assembly comprising tapered converging members on each side of the conveyor chain adapted to engage the edges of each blank bent upward by the breaking assembly and a hold-down plate centrally disposed between the converging members and adapted to hold the body portion of each blank flat, whereby the rail portions are erected to positions perpendicular to the body, and a partition-forming assembly adjacent the rail-forming assembly comprising upper and lower paddle wheels beneath and above the plane of the conveyors, the upper paddle wheel being circumferentially grooved to support and guide the rail portions in the perpendicular position and to hold down the blank, the lower paddle wheel being constructed and arranged to break the partition portions of the blank loose from the body portion and bend them partly upward, and the upper paddle wheel being constructed and arranged to erect the partition portions to a position perpendicular to the body portion and engage them with the rail portions.

2. A machine for forming, from flat blanks, partitioned trays of the type comprising a body portion spaced rail portions extending longitudinally of the body portion and parallel therewith, said rail portions having support portions perpendicular to the body portion, and transverse portions perpendicular to the body portion and interlocked with the rail portions, said machine comprising, in combination, an elongated conveyor having means for maintaining the position of successive blanks thereon, means for loading successive blanks onto the conveyor, a breaking assembly spaced from the loading means along the path of the conveyor comprising a breaking member adapted to press on the blanks and a fulcrum member laterally spaced from the breaking member and adapted to support the edges of the blanks, a rail-forming assembly comprising tapered converging members on each side of the conveyor adapted to engage the edges of each blank and a hold-down member centrally disposed between the converging members and adapted to hold the central portion of each blank flat, whereby the rail portions are erected to positions perpendicular to the body, and a partition-forming assembly adjacent to the rail-forming assembly comprising a first member at one side of the conveyor adapted to partially bend a trailing partition portion of a blank on the conveyor away from the body of such blank, a second member at the other side of the conveyor adapted to engage the edge of such partially bent portion, means to drive the first member, and means to drive the second member in the same direction as the conveyor at a speed faster than the conveyor to complete the bend.

3. In a machine for forming partitioned trays having longitudinal rail portions and transverse partition portions from flat perforated blanks, a conveyor having positioning members adapted to position blanks thereon, means along the conveyor for bending the rail portions upward perpendicular to the body of each blank, and means along the conveyor for thereafter bending the partition portions upward perpendicular to the body to interlock with the rail portions, said latter means comprising a rotatable paddle beneath the conveyor adapted to strike a partition portion to partially bend it upward, and a rotatable paddle

above the conveyor adapted to strike the under edge of a partition so partially bent to complete the perpendicular bending, the rotations of said paddles and the progression of the conveyor positioning members being in such phase relation that the upper paddle strikes each partition after it has been partially bent upward by the lower paddle.

4. In a machine for forming partitioned trays from flat blanks having longitudinal rail portions and transverse partition portions, a conveyor having positioning members adapted to position blanks thereon, means along the conveyor for bending the rail portions upward perpendicular to the body of each blank, and means along the conveyor for thereafter bending the partition portions upward perpendicular to the body to interlock with the rail portions, said latter means comprising a first member at one side of the conveyor adapted to partially bend a trailing partition portion of a blank on the conveyor away from the body of such blank, a second member at the other side of the conveyor adapted to engage the edge of such partially bent portion, means to drive the first member, and means to drive the second member in the same direction as the conveyor at a speed faster than the conveyor to complete the bend.

5. In a machine for forming partitioned trays having longitudinal rail portions and transverse partition portions from flat blanks, a conveyor, means along the conveyor for bending the rail portions upward perpendicular to the body, and means along the conveyor for thereafter bending the partition portions upward perpendicular to the body to interlock with the rail portions, said latter means comprising paddle wheels above and beneath the conveyor having paddles adapted to successively engage the partition portions to bend them perpendicularly upward to interlock with the rail portions, the upper of said paddle wheels being circumferentially grooved to support and guide the rail portions in the perpendicular position while the partition portions are so bent and interlocked therewith.

6. A machine for folding cartons from flat blanks having foldable portions to form side rails and transverse partitions, comprising in combination: conveyor means; set-up means positioned along said conveyor means to set up said side rails; and means positioned further along said conveyor means to set-up said transverse partitions into intermeshing engagement with said side rails, said last mentioned means including a guide constraining portion aligned along said conveyor and serving to receive, guide and support the side rails of each blank in set-up position, whereby the side rails are prevented from collapsing while the transverse partitions are set up and intermeshed therewith.

7. A machine for forming partitioned trays, having a pair of longitudinal partitions and at least one transverse partition, from flat pre-scored blanks, comprising in combination: conveyor means; set-up means positioned along said conveyor means to set-up said longitudinal partitions; a pair of cooperating paddle wheels, one on each side of the conveyor means, and having paddles adapted to engage and set up transverse partitions; and means on one of said paddle wheels so positioned in relation to said conveyor means as to receive, guide and support the longitudinal partitions in set-up position, whereby the longitudinal partitions are prevented from collapsing while a transverse partition is set up and intermeshed therewith.

References Cited in the file of this patent

UNITED STATES PATENTS

2,108,334	Hayes	Feb. 15, 1938
2,112,121	Sidebotham	Mar. 22, 1938
2,149,111	Bergstein	Feb. 28, 1939
2,291,063	Staude et al.	July 28, 1942
2,462,513	Kucklinsky	Feb. 22, 1949
2,720,143	Inman	Oct. 11, 1955