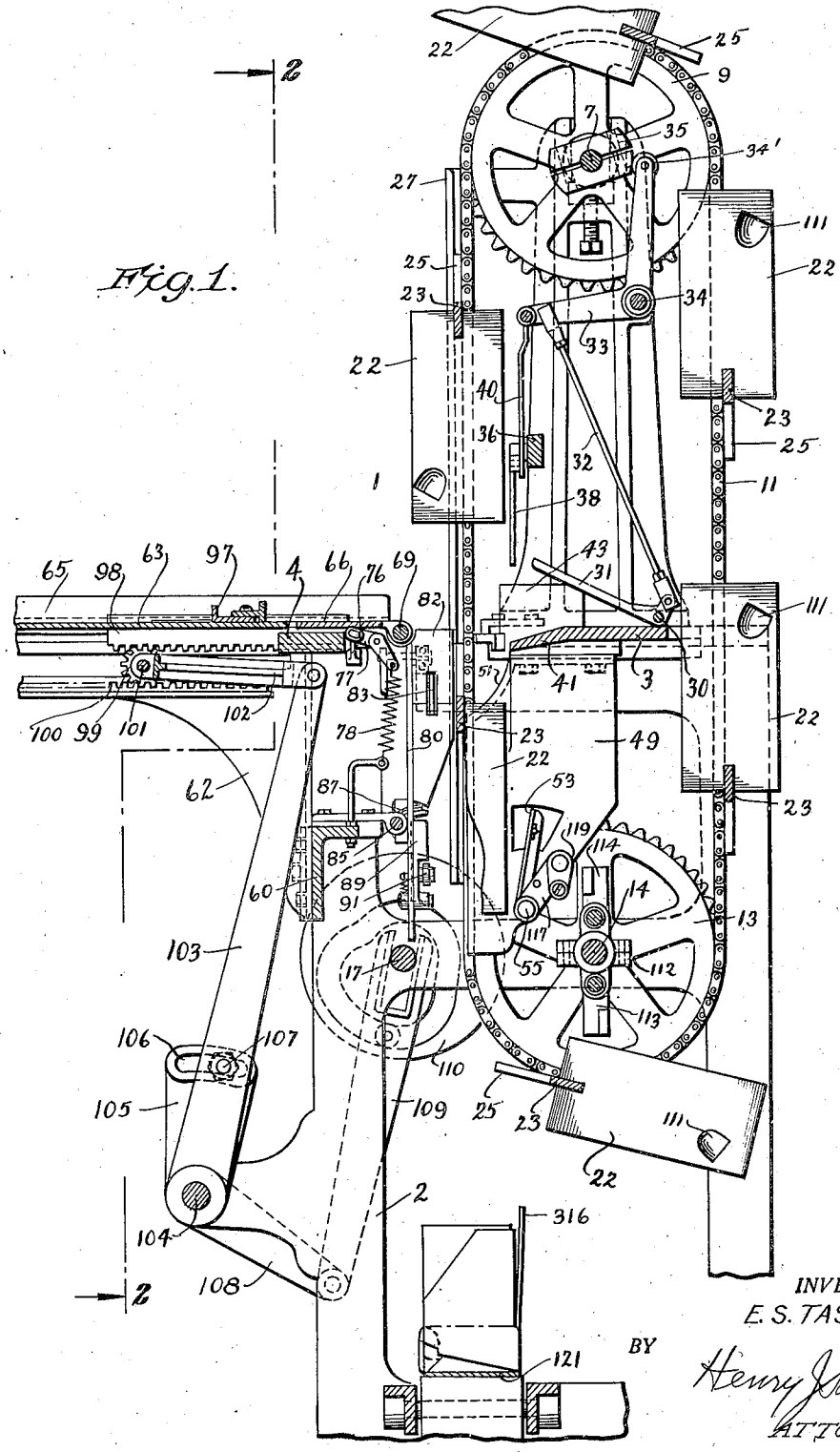
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CARTON FORMING MACHINE

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Fig. 1.



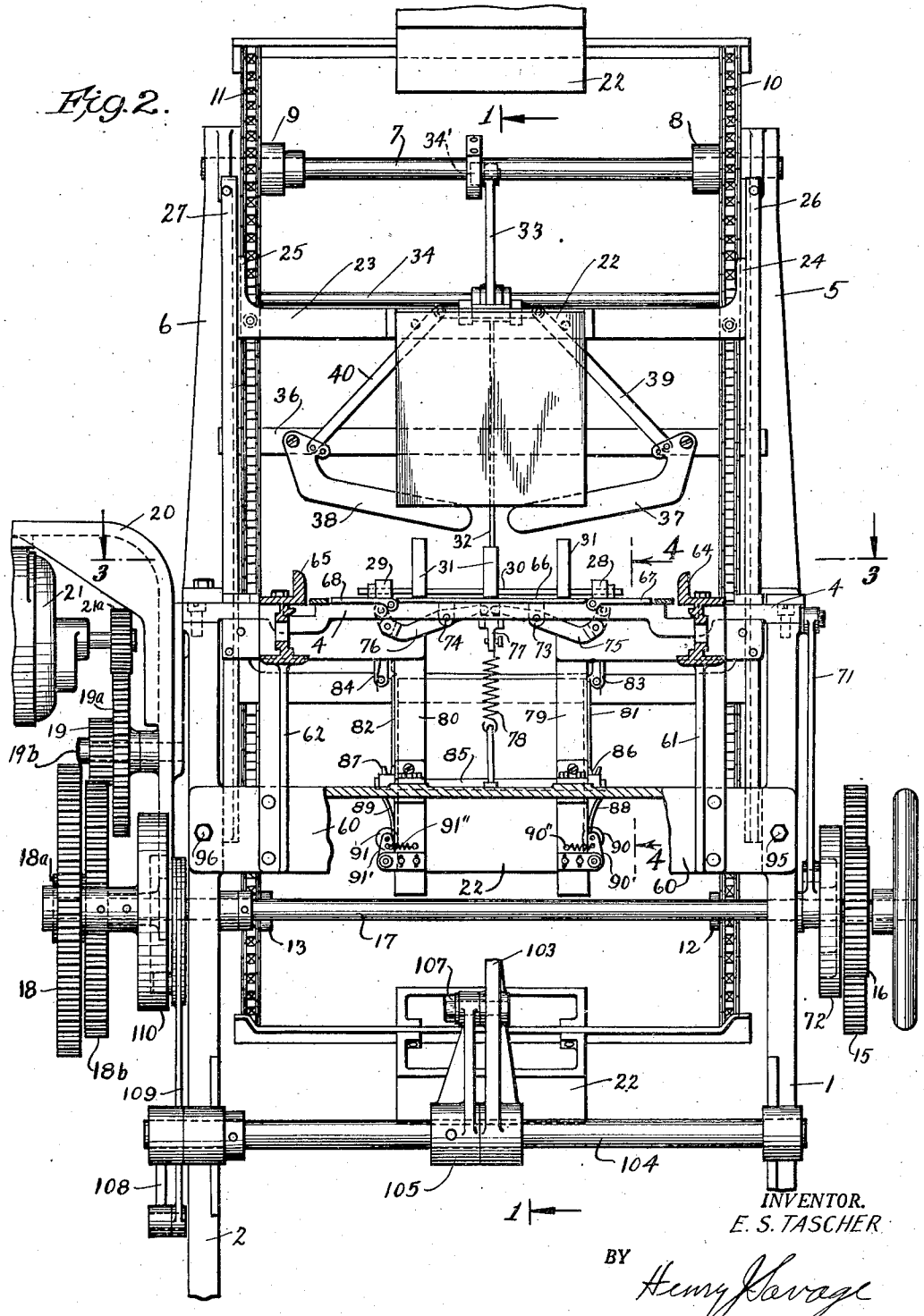
INVENTOR.
E. S. TASCHER
BY
Henry J. Savage
ATTORNEY

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Fig. 2.



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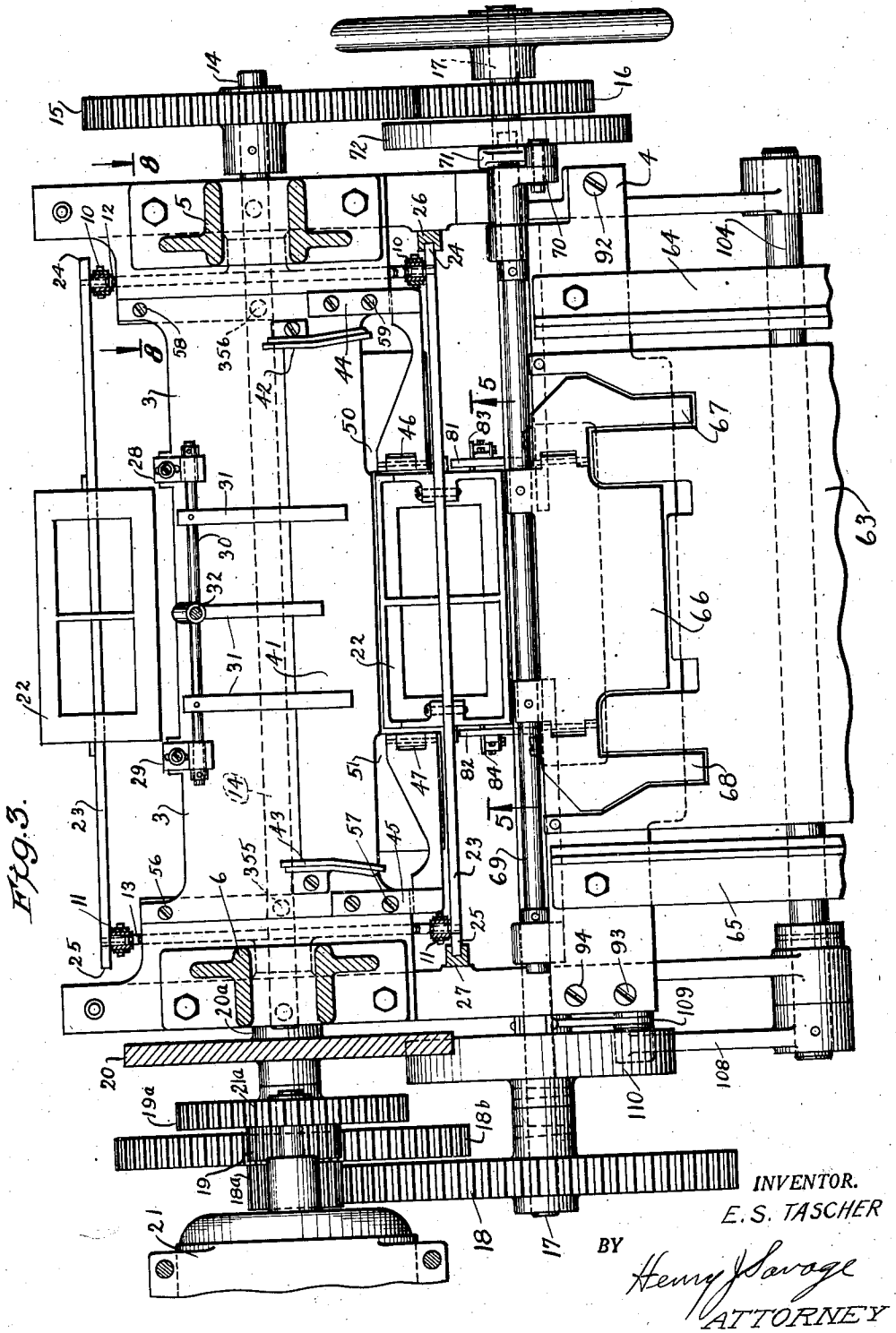


Fig. 3.

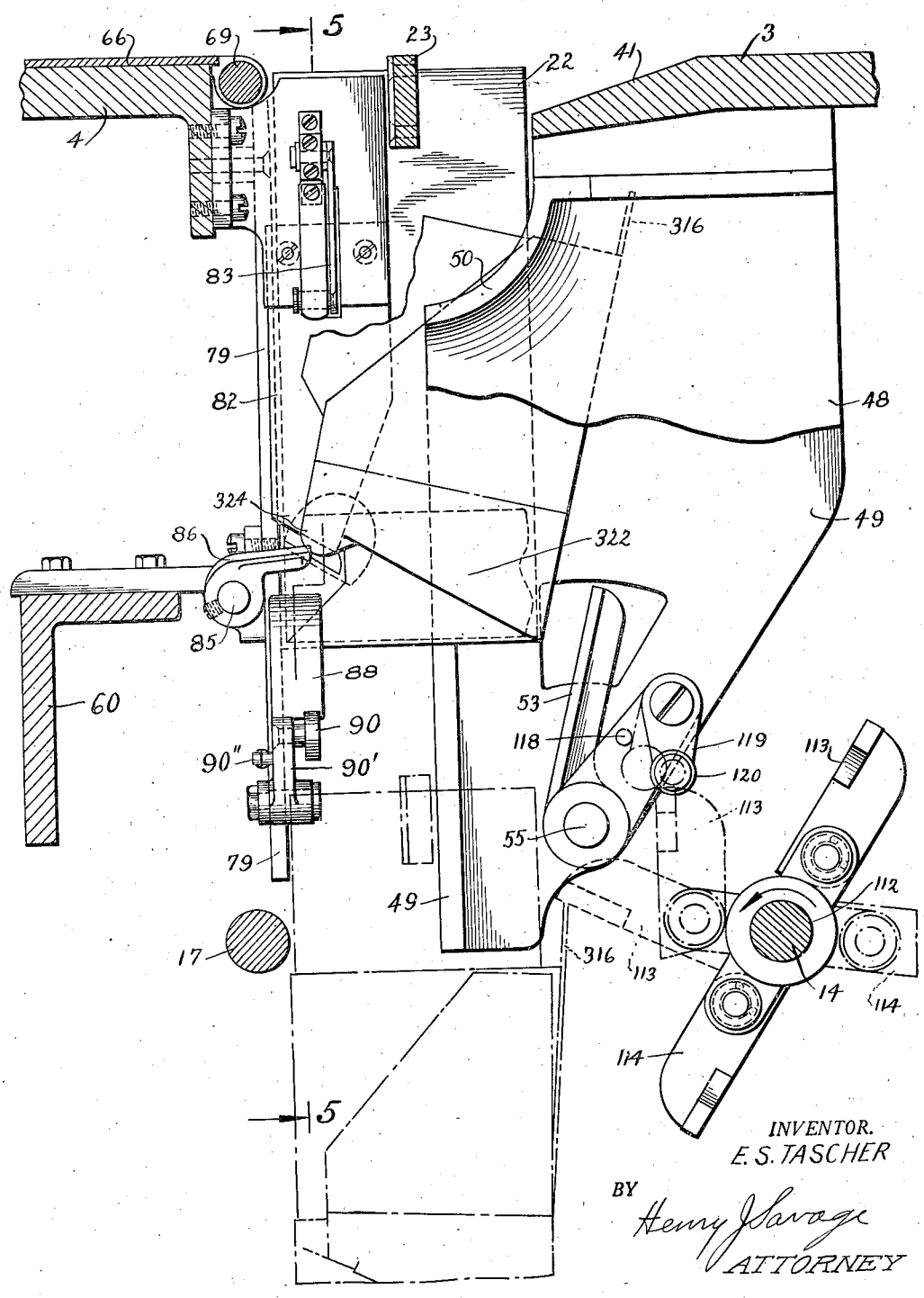
INVENTOR.
E. S. TASCHER
BY
Henry J. Savage
ATTORNEY

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Fig. 4.



INVENTOR.
E. S. TASCHER

BY Henry J. Savage
ATTORNEY

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Fig. 5.

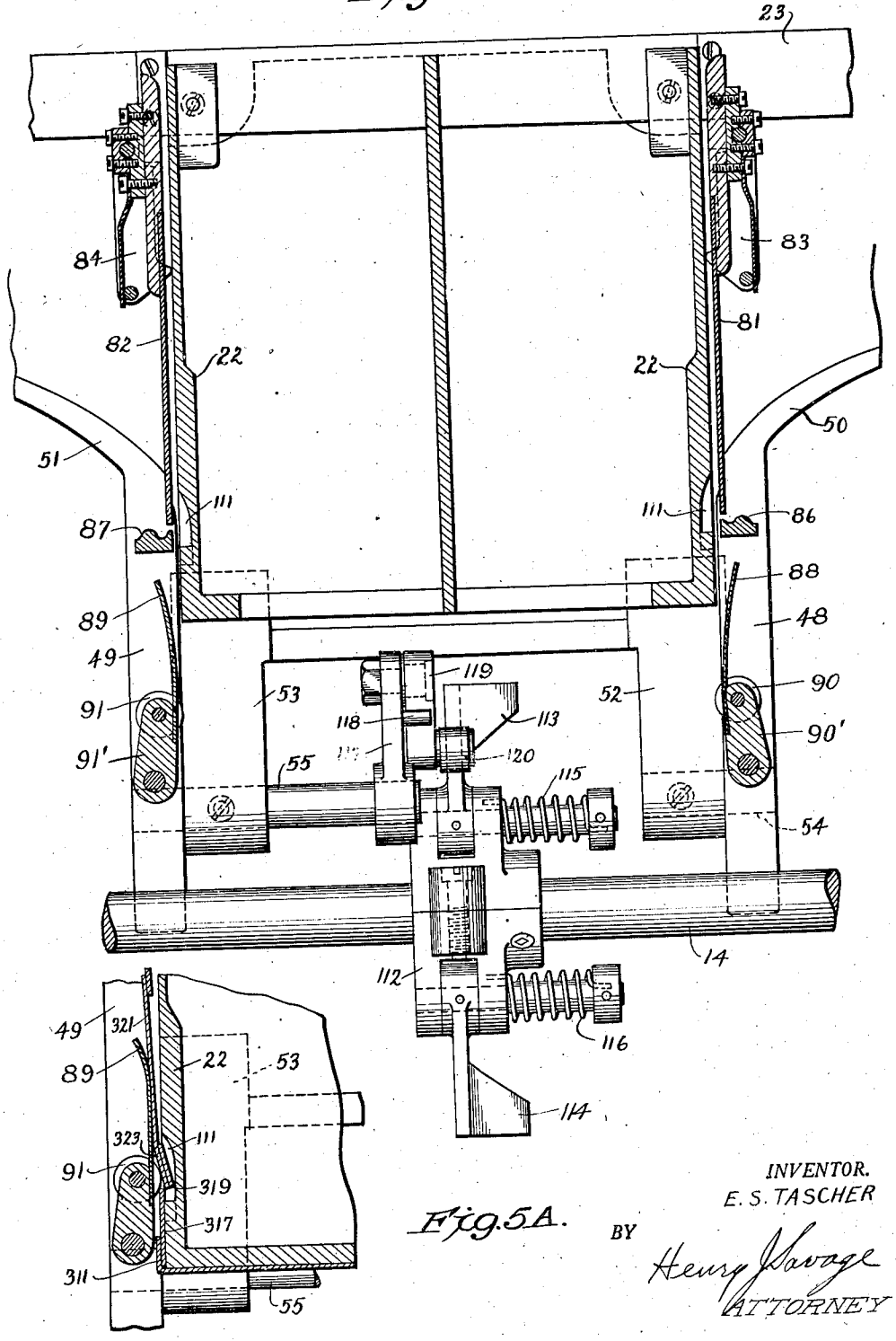


Fig. 5A.

INVENTOR.
E. S. TASCHER

BY Henry Savage
ATTORNEY

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Fig. 6.

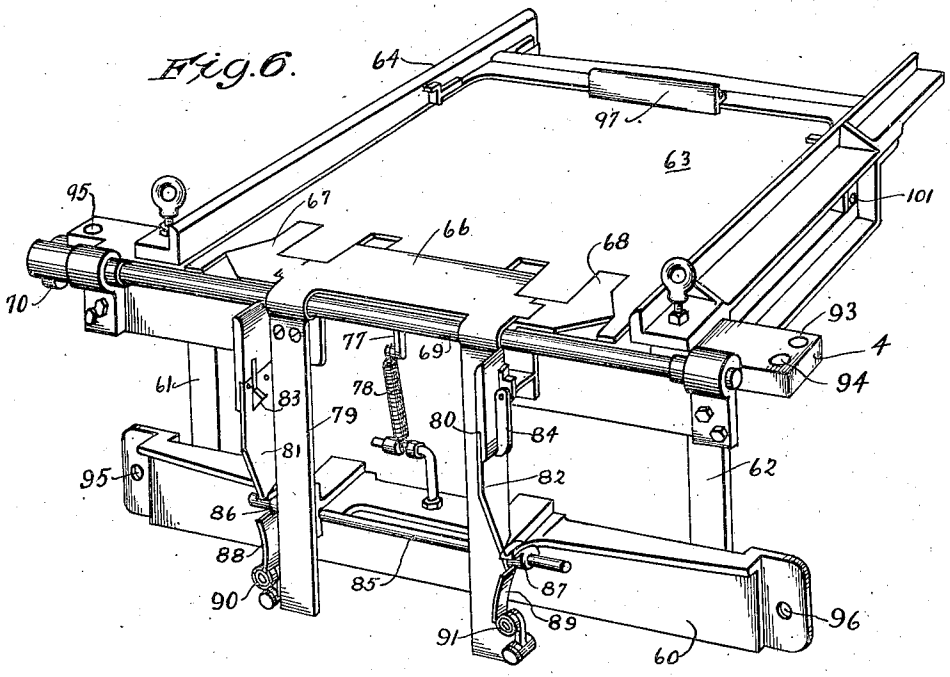
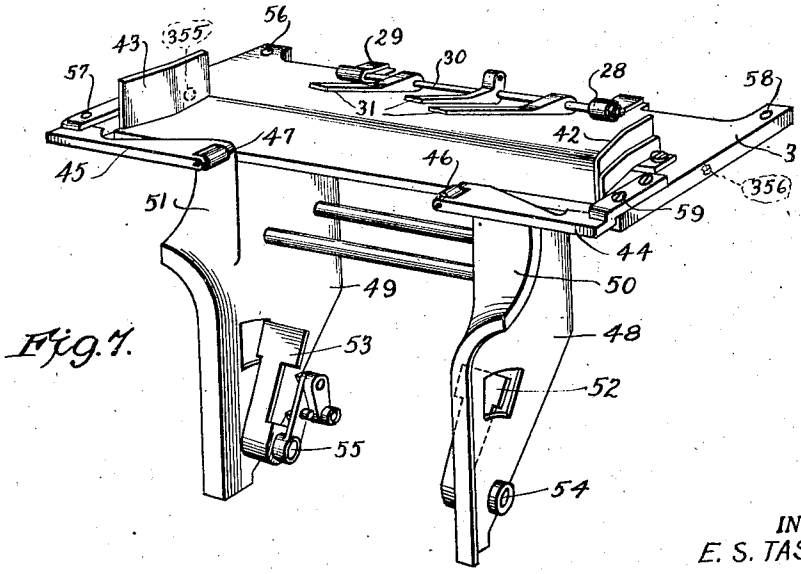


Fig. 7.



INVENTOR.
E. S. TASCHER

BY Henry J. Savage
ATTORNEY

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Fig. 8.

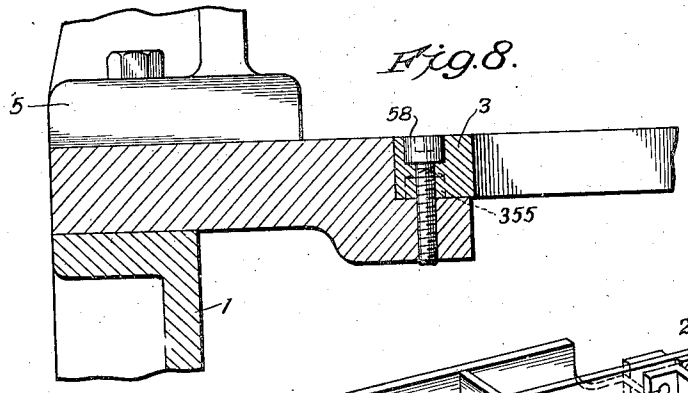


Fig. 9.

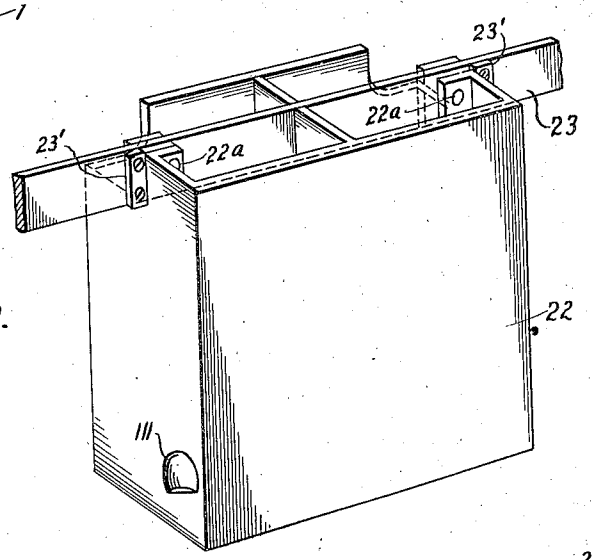


Fig. 10.

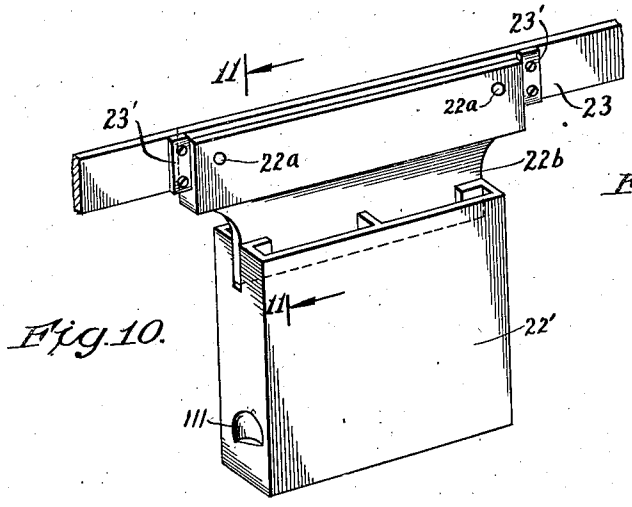
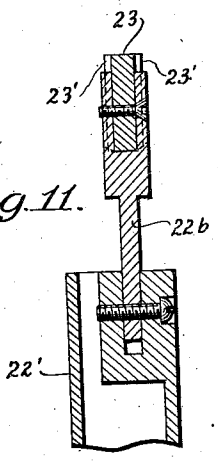


Fig. 11.



INVENTOR.
E. S. TASCHER

BY Henry J. Savage
ATTORNEY

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Fig. 12.

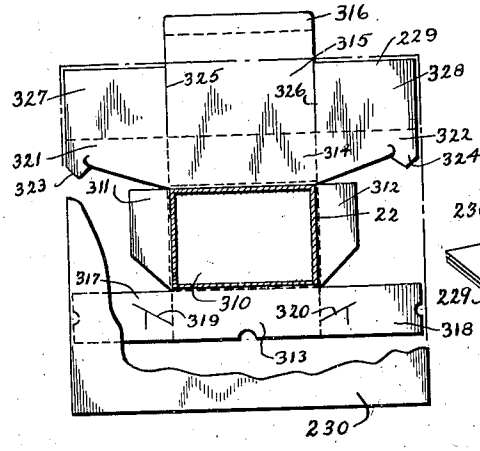


Fig. 13.

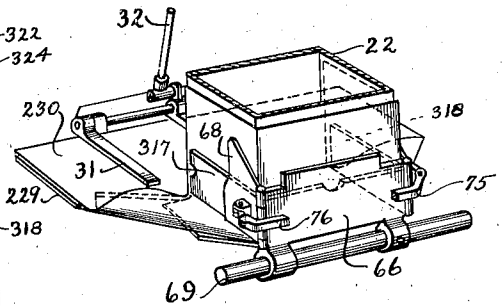
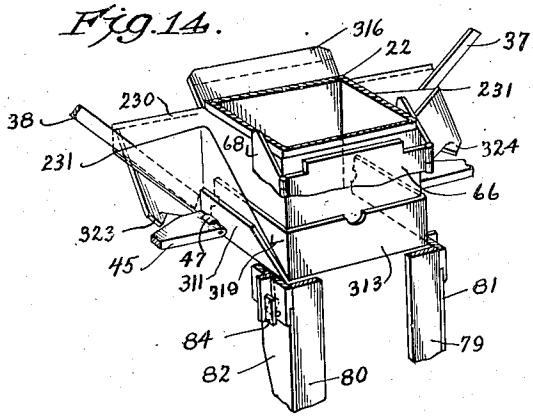


Fig. 14.



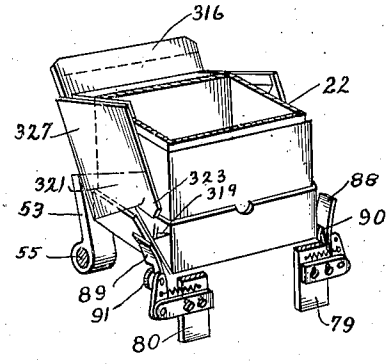


Fig. 15.

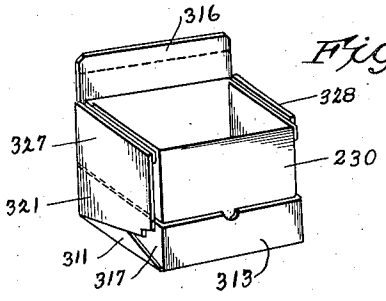


Fig. 16.

INVENTOR.
E. S. TASCHER
BY
Henry J. Savage
ATTORNEY

Patented Dec. 10, 1946 2,412,369

UNITED STATES PATENT OFFICE

2,412,369

CARTON FORMING MACHINE

Eugene S. Tascher, Ingleside, Ill., assignor to National Biscuit Company, New York, N. Y., a corporation of New Jersey

Original application April 17, 1941, Serial No. 388,958. Divided and this application May 24, 1945, Serial No. 595,511

12 Claims. (Cl. 93—51.1)

1

My invention pertains to carton forming machines.

The embodiment that I have selected for illustration is designed particularly for forming cartons, such as are commonly used for packaging crackers, cookies, and other food products but the invention is not limited thereto. Such cartons are formed from carton blanks having side and end flaps and interlocking tongues and slits. In machines heretofore used for forming and folding these cartons, all operations of folding the sides and flaps and inserting the locking tongues in the slits have been performed by cam actuated arms and levers. This requires very accurate adjustment and timing of all the parts and the constant attendance of a mechanic to maintain the adjustment. Even with the greatest care, maladjustments and incorrect timing will occur and many cartons will be destroyed in the operation. Also, because of the intricacy of the mechanism and close adjustments required, the speed of the machine and the number of cartons that can be formed in a stated time interval are limited. Another objection to machines as heretofore used is that they lack flexibility and adjustability, a complete machine being required for each size and style of carton.

An important object of my invention is to simplify the construction and operation of carton forming and filling machines and increase their speed and certainty of operation.

Another object is to do away with the complicated cam and lever mechanisms heretofore used, thereby obviating the difficulties inherent in their operation and timing.

Another object is to provide a machine in which the movement of the carton as it is being formed times the operations of folding, opening the slit and inserting the locking tongues, or in which all operations of the machine are timed by the articles being operated upon.

Another object is to provide sub-frame assemblies carrying the carton folding and locking means that can be removed as units and quickly replaced by other similar interchangeable units to adapt the machine to form different sizes of cartons.

Another object is to make different sizes of forming heads or blocks interchangeable on the cross-bar or bars and operative with the interchangeable sub-frame assemblies.

Another object is to provide an improved means for removing the carton and liner from the former lock.

Still another object is to provide means, whereby the machine may be adapted to forming and locking cartons of many different sizes and shapes.

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The above and other objects and advantages over prior carton forming machines are attained by my invention, an adaptation of which I have illustrated in the accompanying drawings to which reference is had for a full understanding thereof.

Fig. 1 is a vertical section of a carton forming machine made in accordance with my invention, the view being taken substantially on the line 1—1 of Fig. 2.

Fig. 2 is a front view, partly in elevation, partly in section and with parts broken away, the view being taken substantially as indicated by the line 2—2 on Fig. 1.

Fig. 3 is a plan view, partly in section substantially on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged sectional view showing the means for opening the carton slits and inserting the locking tongues, and also the means for removing the carton from the former, the section being indicated by the line 4—4 on Fig. 2.

Fig. 5 is a view at right angles to Fig. 4, the section being indicated by the line 5—5 on Figs. 3 and 4.

Fig. 5—A shows how the slit in the carton blank is opened to insert the tongue.

Fig. 6 is a perspective view of a front sub-frame assembly or unit.

Fig. 7 is a similar view of a rear sub-frame assembly or unit.

Fig. 8 is a section on the line 8—8 of Fig. 3.

Fig. 9 shows a former or mandrel about which a large size carton may be formed.

Fig. 10 shows a small size former and how it is attached to the same cross-bar as that shown in Fig. 9.

Fig. 11 is a section on line 11—11 of Fig. 10 showing the adapter that is used to connect the former to the cross-bar.

Figs. 12 to 16 show five steps in the formation of a carton from a blank and liner as performed by my invention.

My invention in its many aspects and details is adapted to use with different kinds or types of carton forming machines. In Figs. 1 to 11, I have shown how the invention may be adapted to a machine having a number of forming blocks moving in an endless cycle, and delivering only empty cartons. But the machine may utilize hollow formers or blocks and deliver filled cartons.

This application is a division of the joint ap-

plication of William Bazant and myself, filed April 17, 1941, Ser. No. 388,958.

Referring to Figs. 1 and 2, vertical frames 1 and 2 are connected at the top by a removable rear top plate 3 and a removable front top plate 4 and support a pair of vertical columns 5, 6 which have adjustable bearings at their upper ends for a shaft 7. The shaft 7 carries a pair of sprockets 8, 9 over which a pair of endless chains 10, 11 run. The lower ends of these chains pass around a pair of sprockets 12, 13 secured to a shaft 14 mounted in bearings near the lower part of the frames 1 and 2. The shaft 14 extends beyond the frame member 1 (Figs. 2 and 3) where it is secured to a gear 15 that meshes with a gear 16 secured to a cam shaft 17 mounted in bearings in the frames 1 and 2, parallel to the shaft 14. The opposite end of the shaft 17 carries a gear 18 that meshes with a pinion 18a secured to a gear 18b, both of which are mounted on a stub shaft. The gear 18b meshes with a pinion 19 secured to a gear 19a, both of which are mounted on a stub shaft 19b that is fixed in an adjustable arm 20. The arm 20 is adjustable about a bearing 20a that is co-axial with the shaft of a motor 21 having a pinion 21a for driving the gear 19a.

As best shown in Figs. 1 and 3, the top plates 3 and 4 are spaced apart so as to provide an opening through which the carton forming blocks 22 may pass, carrying a carton blank and liner down through the opening with them. The carton formers or heads 22 are secured to cross-bars 23 which are secured near their opposite ends to the chains 10, 11. The cross-bars extend a short distance beyond the chains where their ends are widened to provide cross-heads 24, 25 which slide in the vertical guides 26, 27 that are secured to the frame members 1 and 2.

The rear top plate 3 has a pair of bearings 28, 29 in which a rock shaft 30 is mounted. This rock shaft has liner holding bars 31 secured to it and one of these bars has a short extension or arm to which one end of a link 32 is connected. The upper end of this link is connected to one arm of a bell-crank 33 mounted on a shaft 34 supported in bearings on the vertical columns 5, 6. The other end of the bell-crank carries a roller 34' which is adapted to be actuated by a cam 35 carried by the shaft 7. As shown in Fig. 1, the cam 35 may be a split cam which is readily adjustable on the shaft 7.

A cross-frame member 36 is supported on the columns 5, 6 and carries a pair of pivotally mounted fold straightening fingers 37, 38 which have short arms adjustably connected to a pair of links 39, 40 the upper ends of which are connected to the outer end of the horizontal arm of the bellcrank 33.

The inner or forward edge of the top plate 3 is inclined downwardly at 41 toward the opening between the two top plates 3 and 4 and adjacent each side of the inclined portion is a carton blank guide 42, 43 (Fig. 3).

A forwardly and inwardly extending arm 44, 45, is secured to the rear top plate 3 adjacent each of the guides 42, 43 (Figs. 3 and 7) which arms project into the opening between the two top plates and at their opposed edges may be rounded or carry rollers 46, 47 which will be close to the edges of the formers 22 as they pass between the plates and will fold up the bottom end flaps of the carton blank.

A pair of downwardly extending guides 48, 49 are secured to the underside of the rear top plate

and have downwardly and inwardly inclined surfaces 50, 51 which turn in the back end flaps of the carton blank, as best shown in Fig. 7.

Near the lower ends of these vertical guides are a pair of fixed back closing plates 52, 53 which fully turn up the back side of the carton blank to complete the formation of the carton as the blank is carried down by one of the forming blocks.

The two back closing plates are fixed in operation but are adjustable on short stubs 54, 55 so that their inclination or slope can be adjusted.

It will be noted that the liner holding bars 31, the guides 42, 43, the arms 44, 45, the vertical guides 48, 49, and the back closing plates 52, 53 are all secured to and supported by the rear top plate 3 and this entire assembly is removable as a unit from the machine simply by removing the four screws or bolts 56, 57, 58 and 59 (Figs. 3 and 7).

Secured to the frame members 1 and 2 below the front top plate 4 is a cross-plate 60 (Figs. 1 and 2) which is connected by a pair of brackets 61, 62 to the top plate 4. The brackets extend rearwardly and support a feed table 63 and a pair of carton blank and liner guides 64, 65.

The inner edge of the feed table is recessed to receive a folding plate 66 to the opposite ends of which are pivoted the wings 67, 68. The plate 66 is fixed to a rock shaft 69 which is supported in bearings adjacent the front edge of the top plate 4. At one end the shaft 69 has a short crank 70 (Fig. 3) which is connected to the upper end of a pusher rod 71, the lower end of which is slotted to straddle the shaft 17 and has a roller engaging in a groove in a cam 72 fixed to the shaft 17.

The lower side of the folding plate 66 has a pair of lugs 73, 74 in which levers 75, 76 are pivotally supported. The outer ends of these levers are connected by short links to the underside of the wings 67, 68. The inner ends of the levers 75, 76 fit loosely in one end of lever 77 which is pivoted to the top plate 4 and at its opposite end is connected to a spring 78 the lower end of which is connected in any suitable manner to the cross-plate 60.

A pair of vertical front guides 79, 80 (Figs. 1 and 2) are connected at their upper ends to the top plate 4 and adjacent their lower ends to the cross-plate 60. Near the tops of these vertical guides are secured vertical front flap guides 81, 82 each of which has a slit near the top through which the nose or point of a spring pressed breaker finger 83, 84 projects. Secured to the vertical guides 79, 80 is a short fixed shaft 85 to which are fixed a pair of tongue guide fingers 86, 87 (Figs. 2 and 4). Beneath the tongue guide fingers, each of the front guides carries a tongue guide 88, 89 and a tongue presser roller 90, 91. As best shown in Figs. 2, 4 and 5, the guide 88 and roller 90 are carried by an arm 90' pivoted to the guide 79 and are urged inwardly by the spring 90''. Similarly, the guide 89 and roller 91 are carried by the pivoted arm 91' which is yieldably pulled inward by the spring 91''. It will be noted that the breaker fingers, the tongue guide fingers, the tongue guides, and the tongue presser rollers are substantially in alignment and they are adjacent the path which will be travelled by the slits cut in the carton blanks as the carton blanks are carried down by the former heads.

The front top plate 4, the cross-plate 60, the brackets 61, 62, the feed table 63, the front folding plate 66, the wings 67, 68, the shaft 69, the levers 73, 76, 77, the spring 78, the vertical guides

79, 80, the flap guides 81, 82, the breaker fingers 83, 84, the tongue guide fingers 86, 87, the tongue guides 88, 89 and the presser rollers 90, 91 are all secured together as a unit and can be removed from the machine as a unit simply by disconnecting the pusher rod 71, the lever 103 and removing the three bolts 92, 93, 94 in the top plate and the two bolts 95, 96 in the cross-plate. This unit may be provided with eye-bolts for ease in handling, as shown in Fig. 6.

The feed table has a carriage 97 (Fig. 1) which is secured to a pair of racks 98, meshing with a pair of pinions 99 which in turn mesh with a pair of racks 100 formed in or secured to the supporting brackets 61, 62. The pinions 99 are keyed to a shaft 101 to which a link 102 is pivotally connected, the other end of the link being pivoted to a rocking lever 103, the lower end of which is loosely mounted on a rock shaft 104. A short arm 105 is keyed to the shaft 104 adjacent the lever 103 and at its free end has a slot 106 through which passes a bolt 107 which screws into the lever 103. By means of this slotted arm the limits of the stroke of the feed carriage can be adjusted.

The shaft 104 is mounted in bearings on the frame members 1 and 2 and at one end has an arm 108 keyed to it, the free end of the arm being pivotally connected to the lower end of a pusher rod 109 which at its upper end has a slot straddling the shaft 17 (Fig. 1) and a follower which runs in the groove of a cam 110 keyed to the shaft 17. The construction of the feed carriage 97 and of the racks and pinions by which movement of the lever 103 is transmitted to the feed carriage is not shown in all of its details because it is of usual construction and per se does not form any part of the present invention. The operation and construction of these parts are well-known to those skilled in this art.

Returning now to Fig. 1 there are six carton forming heads 22 shown on the chains but any suitable number may be used. These formers are rectangular in outline and the bottom of each former as it descends on the left hand side of the chain (Fig. 1) is of substantially the same size as the bottom of the carton that is to be formed. Each of these formers or heads has a recess 111 on each side which, as it carries the carton blank downward, will have its lower inclined edge come substantially in alignment with the slit that is formed in the front flaps of the carton blank. These recesses 111 and the slit in the carton blank come in alignment with the breaker fingers 83, 84, the function of which is to press in on the carton material adjacent the slits and break any fibers that may be adhering or which were not cut completely through when the carton blank was cut out. As the former then passes down carrying the carton with it, the guide fingers 86, 87 engage the locking tongues on the rear carton flaps and turn them in so that they will engage behind the guides 88, 89 and then as the former continues on down the rollers 90, 91 will press the material of the carton adjacent the top edge of the slit into the recesses 111 so that the slit is opened and the locking tongue can be forced through the slit to complete the formation of the carton, (Figs. 5, 5—A).

When the carton reaches the lower end of the guides 79, 80, it is completely formed around the forming block. The tucking flap 316 extends up from the rear wall of the carton as shown in Figs. 1 and 16 as is usual in this type of carton. Since these cartons are not filled they are very light and will not drop always from the formers due to their own weight. In order to assure removal of the cartons from the formers I have provided the striker arms which are best shown in Figs. 1, 4 and 5. A striker head 112, which may be made in two parts so as to be adjustable, is secured to the shaft 14 and carries a pair of pivoted arms 113, 114 which are restrained against movement reverse to the direction of rotation of the shaft 14 by coil springs 115, 116. An arm 117 carrying a stop 118 is adjustable on the stub 55 that carries the back closing plate 53 and at its outer end the arm has a short lever 119 carrying a roller 120 loosely pivoted on it. This short arm is adapted to swing forward until it strikes the stop pin 118 as shown in dotted lines in Fig. 4. The position of the striker head on the shaft 14 is adjusted so that one of the arms 113 or 114 will contact the roller 120 and swing the arm against the stop 118 at the time a former has passed the lower ends of the guides 48, 49 and 79, 80 when the carton surrounding the former will be in the position shown in dotted lines in Fig. 4. When the arm (as say, 113) strikes the roller 120, it will be stopped but the shaft 14 will continue to rotate thus relatively turning the arm 113 backward about its pivotal support and putting tension on the spring 115. As the shaft continues to rotate, a point is reached, as shown by dotted lines in Fig. 4, when the striker 113 will snap past the roller 120 and strike the upstanding edge of the closing flap 316 of the carton and push it from the former. The carton will then drop to the conveyor belt 121 and be carried up to the packaging machine or wherever it is to be used.

The machine shown in Figs. 1 to 11 is designed to make cartons of many different sizes. Heretofore, when changing a machine of this general type to make a different size carton, it was necessary to substantially rebuild the machine because the blank feeding mechanism and all the guides and stops on the front and rear plates had to be changed and the opening between the two plates either narrowed or widened to suit the different size carton. It was also necessary to change the timing of all the cams and operating levers throughout the machine. It was also necessary to change the relative position of the chains 10, 11 because the forming blocks 22 were of different heights for different cartons. It was a matter of several days' work to change a machine over from one size to another and required the services of highly skilled mechanics.

By means of the present invention, the machine can be changed over from one size to another in a very short time, usually not more than ½ hour by two mechanics. This is a great advantage over previous machines which were so difficult to adjust for use of different size cartons that it was the usual practice to have a complete machine for each size carton.

With the present invention, it is not necessary to change the timing of any of the mechanism when changing from one size carton to another. All that is done is to remove the front and rear interchangeable units, as illustrated in Figs. 6 and 7, and replace each one with a corresponding unit adapted for the new size of carton. The formers 22 are also changed but these are adapted to be connected to the cross-bars 23 so that the lower edge of each former, as it comes down in contact with the carton blank, is the same distance below its cross-bar 23 irrespective of the size of the carton or former. The means for interchangeably connecting the different formers

to the cross-bars is illustrated in Figs. 9 to 11. Fig. 9 illustrates the former substantially as shown in Fig. 1. Each cross-bar **23** has a pair of locating lugs or stops **23'** which are spaced apart a distance equal to the largest size of former that will be used on the machine. This is as shown in Fig. 9. Each former has a slot in its upper end in which the cross-bar **23** fits so that the lugs **23'** abut the two sides of the former. Pins or bolts **22***a* then secure the formers to the cross-bar. In Fig. 10 we have illustrated the smallest size of former which may be used on the machine. In this case an adapter **22***b* is secured to the former **22'** and at its upper end this adapter has a slot to receive the cross-bar **23** and is of the same length as the former **22** so that the adapter will fit snugly between the locking lugs **23'**. The adapter is then secured to the cross-bar **23** by the same pins or bolts **22***a* that are used for securing the other sizes of formers. The adapter **22***b* is of such length that when the former **22'** is secured to the cross-bar the distance from the cross-bar to the bottom of the former would be exactly the same as the distance from the cross-bar to the bottom of the former **22**. This relation is the same for all sizes of formers intermediate the largest and smallest sizes illustrated. By keeping this distance constant from the cross-bars to the bottom of the formers, it is not necessary to change the timing of the chains **10**, **11** when changing from one size carton to another. All that is necessary then in changing the formers is to remove the pins or bolts **22***a* which releases the formers then on the machine and to replace them with a different size, securing the new formers in exactly the same relative position to the chains by means of the pins **22***a*. When the formers are thus assembled on the machine and the proper size removable front and rear units are in place the machine is ready for operation with the new size carton and it is not necessary to change the timing of any of the parts except in some cases it may be advisable to make a slight adjustment of the striker arms **113**, **114**.

The method of folding the carton blank and liner is shown in Figs. 12 to 16. A carton blank **229** and liner **230** are fed into the machine as shown in Fig. 12 spanning the gap between the front plate **4** and the rear plate **3**. The carton blank is marked with score lines so as to provide a panel **310** which will form the bottom of the carton and which lies directly over the opening in the top frame and beneath the former **22**. Other score lines on the blank provide bottom end flaps **311**, **312**, a front panel or side **313**, a back side or panel **314**, a cover **315** and a tuck **316**. At the two ends of the front panel **313** are front flaps **317**, **318** each of which is provided with a slit **319**, **320**. The back wall of the carton **314** is provided with opposite end flaps **321**, **322** each of which has a locking tongue **323**, **324** which, when the carton is formed enter the respective slits **319**, **320**. Cuts **325**, **326** separate top closing flaps **327**, **328** from the cover **315** and these top flaps are connected along score lines to the end or locking flaps **321**, **322**. This carton blank is of usual form.

When the carton blank and liner have been inserted in the machine the former **22** descends. The first operation as the bottom of the former starts to force the carton blank down between the front and rear top plates is for the cam **72** to rock the shaft **69** which raises the front plate **66** folding up the front of the liner and the front wall **313** of the carton. At the same time, through the pull of the spring **78**, the end flaps **67**, **68** are turned in folding in the sides of the liner and the front end flaps **317**, **318** as shown in Fig. 13. As the former continues to press the carton blank and liner down the next operation is for the rollers **46**, **47** to fold up the bottom end flaps **311**, **312** together with the overlying fold of the liner as shown in Fig. 14. In this position the fold straightening fingers **37**, **38** have straightened out the rear folds **231** in the liner and the carton is substantially in the position shown in Fig. 14. The fingers **37**, **38** are now swung up and as the carton continues to descend, the back panel **314** of the carton and top **315** are folded up by the downwardly and inwardly inclined front edge **41** of the rear plate **3**. The inclined faces **50**, **51** of the vertical guides **48**, **49** engage the flaps **321**, **322**, **327** and **328** and gradually fold them inwardly. During this time the slits **319**, **320** have passed beneath the breaker fingers **83**, **84** which break open the slits provided they have not been cut fully open when the carton blanks were formed. As the carton descends further the locking tongues **323**, **324** will engage in the grooves in the guide fingers **86**, **87** which are inclined inwardly toward the former and as the tongues slide along them they are turned in toward the slits and also are positioned the correct distance from the slits so that when the rear side of the carton is folded into its final position by the plates **52**, **53**, the tongues will be in exact alignment and ready to enter the slits **319**, **320** when the latter are opened by pressure of the rollers **90**, **91** on both the tongues and the carton above the slits. (See Fig. 5—A.) These rollers not only open the slits but also press the locking tongues firmly against the sides of the flaps **317**, **318** directly above the slits so that as the tongues are pressed forward by the back closing plates **52**, **53**, the tongues must enter in the slits and lock the carton in formed position. As the former **22** carries the carton down below the rollers **90**, **91** one of the strikers **113**, **114** strikes the flap **316** and pushes the carton off, if it does not drop off of its own weight, to the belt **121** (Fig. 1).

As clearly shown in Fig. 2, the arms carrying the rollers **90**, **91** are urged inwardly by coil springs or other suitable means. While I have shown rollers for opening the carton slits, rounded surfaces or cams on the arms operate satisfactorily but there is less friction and wear when rollers **90**, **91** are used.

The fold straightening fingers **37**, **38** shown in Fig. 2 generally are not necessary when the cartons are small, as say less than one pound capacity, but when larger cartons are used, they assist materially in keeping the liner folds straight and contribute to higher speed of operation. When the machine is used for forming cartons without liners, the liner holding bars **31** and the fold straightening fingers **37**, **38**, together with their operating mechanisms, are omitted.

As shown in Figs. 3, 7 and 8, the rear removable unit used with the machine of Fig. 1 may be positioned on the frame by dowels **355**, **356**.

I have greatly simplified the construction and operation of carton forming machines particularly machines adapted to form cartons from blanks having interlocking tongues and slits.

Heretofore, in machines for forming cartons of this type, the back closing plates, the breaker fingers (if used), the tongue guide fingers, and the slit opening fingers (corresponding to presser rollers **90**, **91**) were all operated by levers which

in turn were actuated by cams. This required very accurate manufacture of all the operating parts and necessitated their being kept in exact adjustment, otherwise the machine would malfunction. This has always been very difficult to do and it has limited the speed at which such machines could be operated.

By means of the present invention all of these moving parts (cams, levers, shafts, fingers) are done away with and the several functions of folding up the back of the carton, opening the slits, inserting the tongues and so forth are performed automatically by stationary parts as the carton being formed is carried past these several parts. In other words, timing of the mechanism is done away with and the carton being operated upon is its own timing means, so that all functions must be performed at the proper time and in the proper sequence. This greatly simplifies the operation of the machine and enables it to be operated at speeds heretofore unattainable because no matter how fast the carton blanks are carried down by the formers, the sequence of operations necessary to fold the blanks into cartons and lock them together are timed and performed automatically by the descent of the carton.

Having thus described my invention and illustrated how it may be used in carton forming machines, I claim all adaptations and equivalents thereof that may come within the spirit or within the scope of any of the following claims.

What I claim is:

1. In a machine of the class described having a supporting frame, a removable unit assembly comprising a top plate, a cross-plate below the top plate, parallel front guides connecting the top plate and cross-plate, fixed front flap guides perpendicular to the front guides and secured adjacent thereto, yieldable breaker fingers fixed to the front flap guides and engageable by carton flaps moving along the guides, fixed guide fingers secured adjacent the outer edges of the front guides below the front flap guides, and yieldable tongue pressers fixed to the front guides below the guide fingers, the breaker fingers, guide fingers and tongue pressers being substantially in vertical alignment successively, the top plate and cross-plate having means for securing the unit assembly to the frame of the machine.

2. In a machine of the class described having a supporting frame, a removable unit assembly comprising a top plate, a cross-plate below the top plate, parallel front guides connecting the top plate and cross-plate, fixed front flap guides perpendicular to the front guides and secured adjacent thereto, fixed guide fingers secured adjacent the outer edges of the front guides below the front flap guides, yieldable tongue pressers fixed to the front guides below the guide fingers, a rock shaft supported on the top plate adjacent its front edge and above the front guides, a folding plate secured to said shaft and normally lying within a recess in the top of said top plate, and a feed table secured to said top plate, all of said parts comprising a removable unitary structure, the top plate and cross-plate having means for securing the unit assembly to the frame of the machine.

3. In a machine of the class described having a supporting frame, a removable unit assembly comprising a top plate, a cross-plate below the top plate, parallel front guides connecting the top plate and cross-plate, fixed front flap guides perpendicular to the front guides and secured adjacent thereto, yieldable breaker fingers fixed

to the front flap guides, fixed guide fingers secured adjacent the outer edges of the front guides below the front flap guides, yieldable tongue pressers secured to the front guides below the guide fingers, a rock shaft supported on the top plate adjacent its front edge and above the front guides, a folding plate secured to said shaft and normally lying within a recess in the top of said top plate, a feed table secured to said top plate, and a pair of brackets having vertical legs connecting the top plate and cross-plate and horizontal legs supporting said feed table, all of said parts comprising a removable unitary structure, the top plate and cross-plate having means for securing the unit assembly to the frame of the machine.

4. In a machine of the class described having a supporting frame, a removable unit assembly comprising a rear top plate, liner guide fingers and stops secured to the top of said plate, bottom flap folders secured to the top plate and extending forwardly and inwardly therefrom, a pair of downwardly and oppositely disposed guides fixed at their upper ends to the top plate and supported wholly thereby, downwardly and forwardly inclined back closing plates disposed between the guides and secured one to each guide adjacent its lower end and supported wholly thereby, the rear top plate having means for securing the unit assembly to the frame of the machine.

5. In a machine of the class described, a removable unit assembly comprising a rear top plate, liner guide fingers and stops secured to the top of said plate, bottom flap folders secured to the top plate and extending forwardly and inwardly therefrom, a pair of downwardly and oppositely disposed guides fixed at their upper ends to the top plate, fixed downwardly and forwardly inclined back closing plates disposed between the guides and secured one to each guide adjacent its lower end and supported wholly thereby, and means for adjusting the inclination of the back closing plates.

6. In a machine for forming a carton from a blank having flaps with slits and flaps with tongues adapted to be inserted in the slits, the combination of a table having an opening therein and adapted to receive a carton blank, a carton former adapted to force the blank downward through said opening, means for folding the sides and flaps on the blank as the former descends, and stationary means in the path of the descending blank becoming automatically operative by the descent of the blank to open the slits and insert the tongues therein.

7. In a machine for forming cartons from blanks having flaps with slits therein and flaps with locking tongues thereon, the combination of a frame having a horizontal table with an opening therethrough, means for positioning a carton blank on the table over the opening, a carton forming head, means for moving the forming head downward through the opening to carry the carton blank with it, vertical guides extending downward from the table adjacent the front edge of the opening, means for folding up the flaps having slits as the forming head forces the blank through the opening, the forming head having recesses over which the slits are folded, breaker fingers secured to the vertical guides in the path of the downwardly moving slits and adapted to press into the recesses, fixed means in the path of the descending carton blank adapted to fold the flaps having tongues so that the forward edges of the tongues lie adjacent the slits, fixed tongue pressers secured to said guides

below the breakers and in the path of said tongues, slits and recesses, whereby the pressers will open the slits and press the entrant edge of the tongues into the plane of the slit openings, and means for pressing the tongues into the slits.

8. In a machine for forming cartons from blanks having flaps with slits therein and flaps with locking tongues thereon, the combination of a frame having a horizontal table with an opening therethrough, means for positioning a carton blank on the table over the opening, a carton forming head, means for moving the forming head downward through the opening to carry the carton blank with it, vertical guides extending downward from the table adjacent the front edge of the opening, means for folding up the flaps having slits as the forming head forces the blank through the opening, the forming head having recesses over which the slits are folded, fixed means in the path of the descending carton blank adapted to fold the flaps having tongues so that the forward edges of the tongues lie adjacent the slits, fixed tongue pressers secured to said guides below the breakers and in the path of said tongues, slits and recesses, whereby the pressers will open the slits and press the entrant edge of the tongues into the plane of the slit openings, and means for pressing the tongues into the slits.

9. In a machine for forming cartons from blanks having flaps with slits therein and flaps with tongues adapted to interlock in the slits, the combination of a horizontal table having an opening therethrough of approximately the size of the bottom of the carton to be formed, means for positioning a carton blank on the table with its bottom panel over the opening, means for forcing the blank downward through the opening, vertical guides depending from the table adjacent the front and rear sides of the opening, the rear guides having means for folding the tongues forward adjacent the slits, the front guides having fixed pressers for opening the slits and pressing the tongues into the plane of the opened slits, and fixed means on the rear guides for pressing the tongues forward and into the opened slits.

10. In a machine for forming cartons from blanks having flaps with slits therein and flaps with tongues adapted to interlock in the slits, the combination of a horizontal table having an opening therethrough of approximately the size of the bottom of the carton to be formed, means for positioning a carton blank on the table with its bottom panel over the opening, means for forcing the blank downward through the opening, vertical guides depending from the table adjacent the front and rear sides of the opening, means adjacent the rear guides for folding the tongues forward toward the slits, stationary pressers adjacent the front guides for opening the slits and pressing the tongues into the plane of the opened slits, and stationary means adjacent the rear guides for pressing the tongues forward and into the opened slits, said stationary pressers and said stationary means operating to perform their functions as the carton blank is moved downward past them.

11. In a carton forming machine having a frame, a removable unit assembly comprising a rear top plate, spaced carton blank guides on said top plate, bottom flap folders secured to the top plate and extending forwardly and inwardly therefrom, a pair of downwardly and oppositely disposed guides fixed at their upper ends to the top plate and supported wholly thereby, downwardly and forwardly inclined back closing plates disposed between the guides and secured one to each guide adjacent its lower end and supported wholly thereby, the rear top plate having means for securing the unit assembly to the frame of the machine.

12. In a machine for forming a carton from a blank having bottom, front, rear and end panels formed thereon and end flaps with slits therein and end flaps with tongues adapted to interlock in the slits; the combination of a frame, front and rear top plates secured to said frame and spaced apart a distance substantially equal to the width of the bottom panel of the carton blank, means for positioning a carton blank on said plates with its bottom panel over the space between them, a carton forming head, means for moving the forming head downward between said plates to carry the carton blank with it; means fixed to and supported by the front top plate for successively turning up the front panel and the slitted end flaps, and opening the slits as the forming head carries the blank downward; means fixed to and supported by the rear top plate for successively turning up the end panels, then turning up the rear panel and end flaps with tongues and pressing the tongues fully into the slits as the forming head carries the blank downward; said front and rear top plates with their respective supported means being removably secured to said frame and being removable therefrom as distinct front and rear units.

EUGENE S. TASCHER.