July 28, 1964 O. W. CHRISTENSSON 3,142,231

ARRANGEMENT IN MACHINES FOR THE PRODUCTION OF LINED PACKAGES

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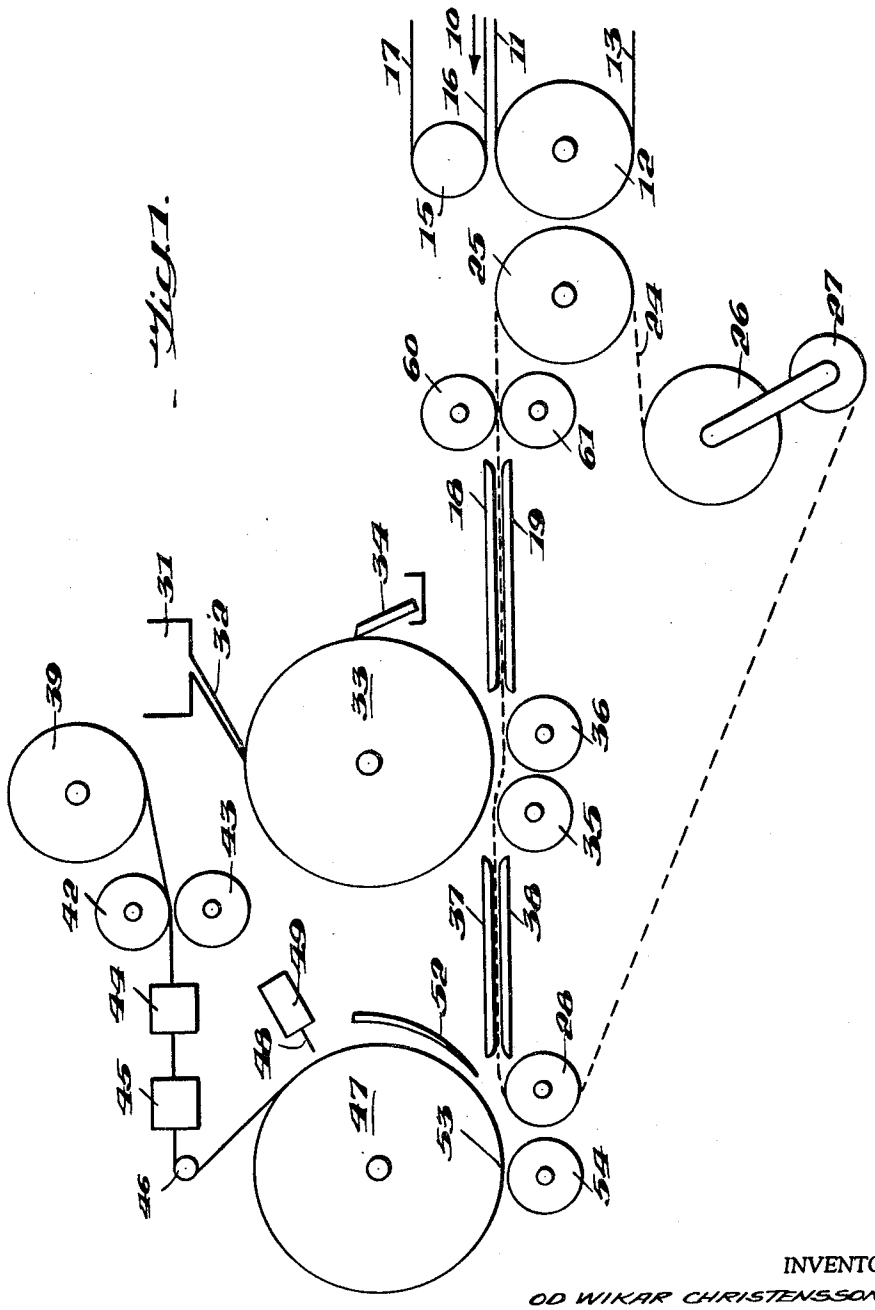
Fig. 1.



INVENTOR

OD WIKAR CHRISTENSSON,

BY Larson and Taylor

ATTORNEYS

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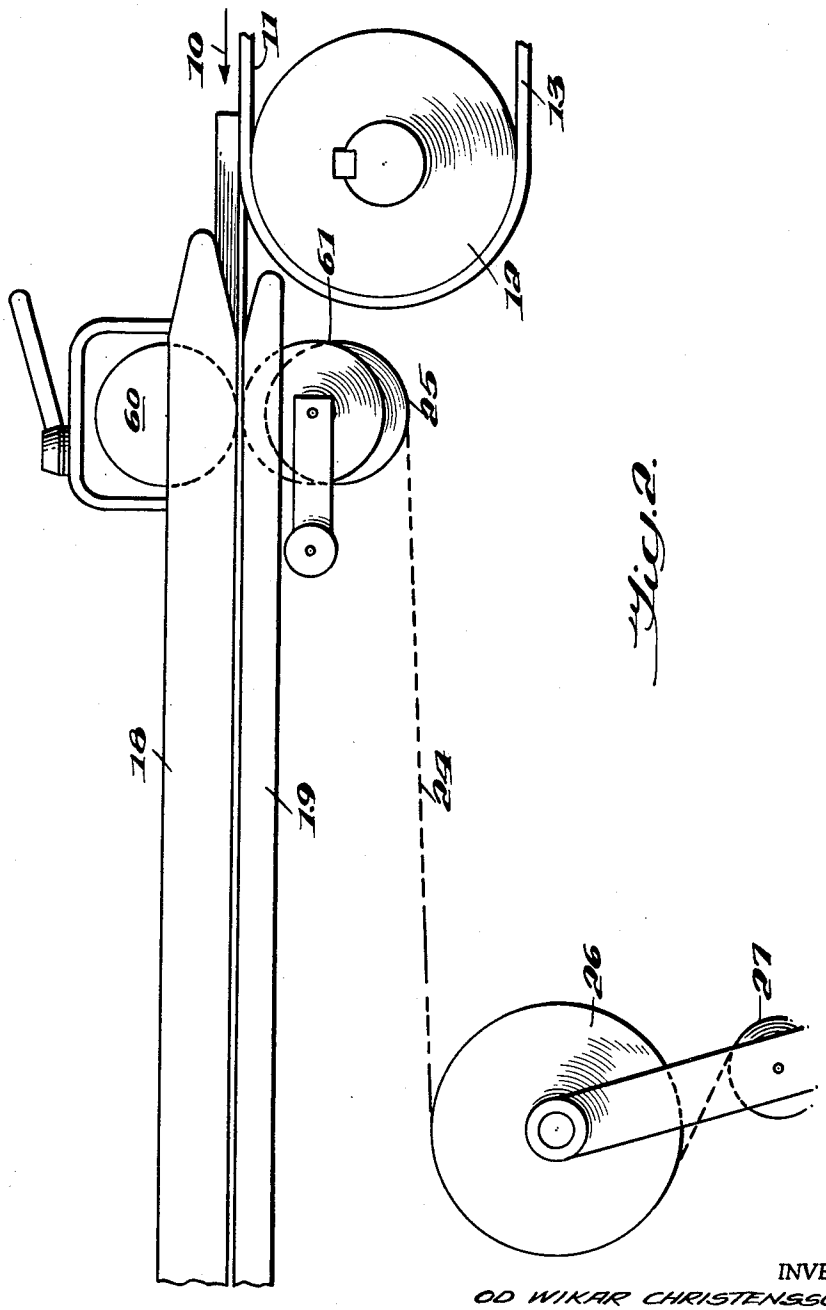

Fig. 2.

INVENTOR
OD WIKAR CHRISTENSSON,

BY Larson and Taylor

ATTORNEYS

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Fig. 3.

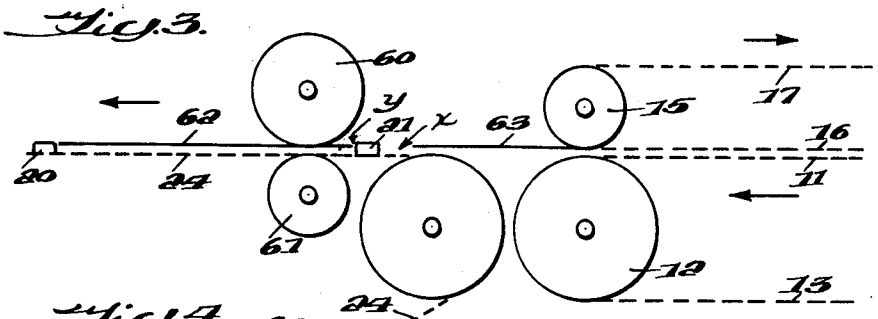


Fig. 4.

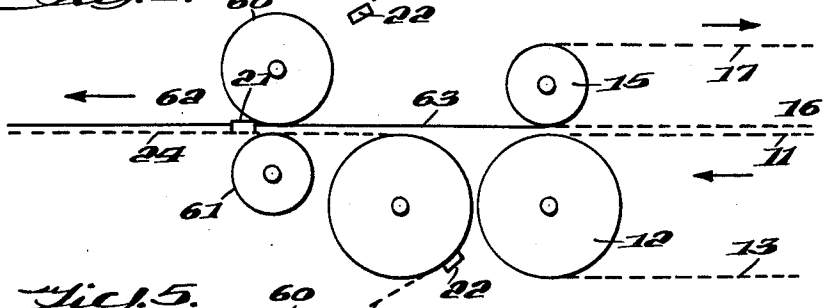


Fig. 5.

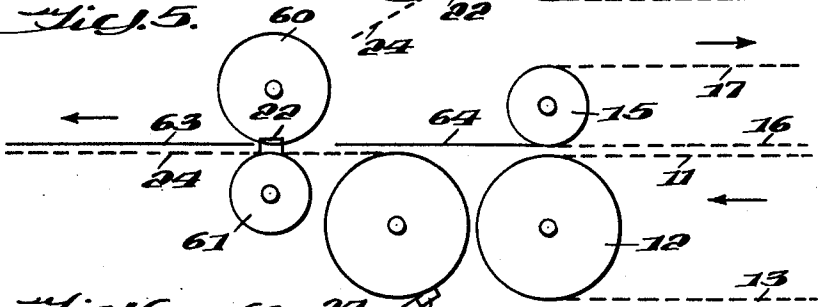
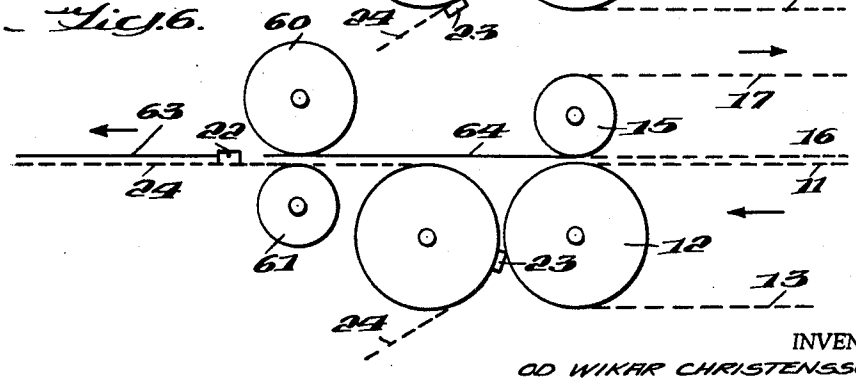


Fig. 6.



INVENTOR
OD WIKAR CHRISTENSSON,

BY Larson and Taylor

ATTORNEYS

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ARRANGEMENT IN MACHINES FOR THE PRODUCTION OF LINED PACKAGES

Od Wikar Christensson, Vikavagen 5, Bromma, Sweden

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11 Claims. (Cl. 93—36.6)

The present invention relates to an arrangement and method in machines for the production of lined packages of cardboard or similar material. In such machines two different paths of transfer are usually used, one for the outer package of cardboard or similar material, and the other for the lining. Before introduction into the machine the outer package is usually subjected to cutting and creasing to form blanks, and further may be provided with printing if desired. Staples for such blanks may be mounted at the beginning of the first path. The lining is usually formed by a weak and easily formable material, for instance waxed paper, metallized paper, thin metal foil, plastic or the like. The lining material is rolled up in a store roller in an even, stripformed state. From the store roller the lining is transferred to a folding and gluing apparatus, in which it is folded and fixed in the form of a tube. If the lining material is plastic or other weldable material, a plastic welding instead of gluing is used. In this tubeformed state the lining is then transferred to a roller, which may fulfill two different functions, viz. firstly carrying the lining in a synchronized position into contact with a simultaneously fed cardboard blank forming the outer package. Secondly the lining tube is attached to the cardboard in some suitable way, and the cardboard blank is then bent together along its already formed creasing lines and glued together into its final tubeformed state.

When using this method of production, as in all methods of production, it may be essential not only to use the existing machinery but also to increase the production capacity of the machines to their maximum. In a production machine of the present kind, a so-called FLM-machine ("folding and lining machine"), the production capacity is determined by two circumstances, viz. the speed the movable parts of the machine work, and the frequency in which the cardboard blanks follow each other. The speed of the movable parts of the machines cannot be increased over a given limit value because the existing centrifugal forces at speeds over the limit will become such that parts of the package to be manufactured, for instance the cut lining, which may follow the rotating parts, will be displaced from their correct positions. In order to obtain a high working capacity in an FLM-machine, it therefore becomes important to feed the packages forward with the smallest possible distance between them.

To make a good closing the lining should, as a rule, be somewhat longer than the outer package. Ideally the minimum spacing with which the packages can be fed forward on the same path in the machine is limited to a relation in which the cut pieces of lining follow contiguously after each other, as if forming a continuous path, even though they are actually cut into formed blanks.

As an example a package, intended for packing half a kilogram or one English pound of coffee in ground state, according to current standard, should have a lining length of 220 millimeters, and an outer package length inclusive of its closing flaps of 197 millimeters. The lining is thus 23 millimeters longer than the cardboard, which means that if the parts are correctly placed relative to each other the mouth of the lining will overlap the upper edge of the closing flap of the cardboard blank by 11.5 millimeters. The stated dimensions further mean that

if the cardboard blanks are to be fed forward as closely as indicated above, the spacing distance between the back end of each blank of cardboard and the forward end of the following blank of cardboard will be only 23 millimeters, and from this spacing an essential part is to be consumed by the means used to cause the forward feeding of the blanks of cardboard.

There are difficulties involved in feeding cardboard blanks forward with this high degree of accuracy simultaneously with maintaining the working speed of the machine at the maximum value, limited by the beforementioned centrifugal forces and the similar circumstances. Hitherto it has been necessary to feed the blanks of cardboard forward with a lower speed than the maximum one, i.e. with a greater spacing distance than the one indicated above. This, however, has caused an additional working time in the feeding process of the lining or of the complete package. As a matter of fact an operator must either introduce a synchronization step for the lining in connection with the blanks of cardboard fed forward so that the lining was fed the one after the other in correct position relative to the blank of cardboard fed forward, or, alternatively, he must allow subsequent linings to extend to a greater spacing by an irregular distance determined by the irregular delay in the feeding forward of the corresponding blanks of cardboard. The latter, however, requires arranging a specific double cutting of each end of the lining with a subsequent loss of material between linings.

The present invention relates to an arrangement for preventing the abovementioned difficulties from arising simultaneously. It is now possible to have the material of the lining fed forward in a path which is already in cut form but which nevertheless is continuous, and to have each of the cardboard blanks meet each separate piece of the lining in its correct position.

Blanks of cardboard, before being combined with the lining in an FLM-machine, are subjected to certain preparatory steps. Firstly, the blanks of cardboard are fed out from a store row and for practical reasons this can take place by friction means attacking the blanks. Therefore, a first possibility of displacement or lag of the blanks of cardboard will occur here. Further, the complete packages are fed out of the machine in an evenly collapsed state, but in order that it will be possible to open them easily it is necessary to make preliminary creasing lines defining the corners of the future package by so-called double folding to break down the fibers. This double folding (a folding of the creasing line by 180°) and the restatement of the blank of cardboard into a flat state must take place in such a way that no damage is caused to the cardboard blank, by which a working standstill could result. In order to prevent this it may be necessary to use conveying means for the blank of cardboard through the zone of the double folding. Here also there may be added slipping and lag in dependence thereof.

It is obvious that in practice the different amounts of lag of the blank of cardboard cannot be expected to be exactly the same. Therefore, in order to feed the blanks of cardboard to the cut pieces of the lining tube in a correct position it may be necessary to re-arrange the blanks of cardboard immediately before combining them with the pieces of the lining tube so that they arrive in correct spaced distances from each other. Fixed catchers may then be used to carry the blanks forward from the place of the re-arrangement to the place for their attachment to the pieces of the lining tube. These fixed catchers are positioned so that they do not permit the predetermined re-arrangement to be altered.

This arrangement forms the specific object for the present invention.

According to the invention an arrangement is made for accelerating the cardboard blanks in such a way that, independently what lag they are subjected to, each will with its foremost end contact the back side of a catcher in front of it during its movement. Then, during such a time that a subsequent catcher can enter in some distance behind the blank of cardboard, means are provided to cause a renewed lag of the blank of cardboard until its back end contacts the foremost side of the subsequent catcher. With the aid of the subsequent catcher the blank of cardboard is thereafter conveyed through the zone of its attachment to the piece of the lining. The said accelerator may preferably consist of a pair of rollers rotating with a higher speed, said rollers being of such a kind that they allow for slipping under the influence of a resistance against the movement of the blank of cardboard, but without the presence of such a resistance will convey the blanks of cardboard with the higher speed with which their periphery is moving. One of these rollers can for instance be smooth and metallic whereas the other roller is made of or covered with rubber. The rollers should thereby rest resiliently against each other.

Further details of the invention will be evident from the following description of one form of execution of the invention, shown in the attached drawings. However, it is of course understood that the invention is not limited to this specific form of execution but that different modifications may occur within the spirit of the invention. In the drawings FIG. 1 shows a principal diagrammatic view of an FLM-machine of the above indicated kind and FIG. 2 shows an enlarged view of the accelerator without any blank of cardboard passing in it. FIGS. 3–6 show schematical views of four different states of the accelerator.

The machine shown in FIG. 1 is assumed to work in a way that the blanks of cardboard are conveyed from the right to the left, i.e. in the direction of the arrow **10**. The blanks run on a path which consists of a pair of moving endless belts, made of leather or textile material or the like, between which the blanks of cardboard are held. Belt **11** passes around a driven or driving roller **12**, and it returns as indicated at **13**. The upper endless belt, see FIG. 1 and FIGS. 3–6, runs with its two branches **16, 17** in a corresponding way around a roller **15**. Both rollers **12** and **15** are machine-driven in mutual synchronism. In practice the rollers **12** and **15** are usually displaced, one before the other. Only lower belt **11** is shown in FIG. 2.

After the rollers **12** and **15** and the belt **11–13** and **16–17**, respectively, in the conveying direction of the cardboard blank, a pair of friction rulers **18, 19** are provided for directing the blanks of cardboard so that they run in correct position in the plane perpendicular to the drawing. These rulers further have the purpose of causing the renewed lag in the direction of travel by friction against the cardboard blank to place it against the subsequent catchers. The blank of cardboard is then conveyed past the rulers **18, 19** by means of an endless chain **24**, a belt or the like, provided with catchers, the positions of which are further shown in FIGS. 3–6 where they are indicated by **20, 21, 22** and **23**. In all of the figures the chain **24** is indicated by dash lines. It runs over a pair of tension rollers **26, 27** over a redirectional roller **25** where it receives the blanks of cardboard, and over a redirectional roller **28** at the output end.

A gluing work is arranged immediately after the rulers **18, 19** in order to provide the cardboard blank with the glue required for attaching the lining tube to the cardboard. This gluing work has only been shown schematically as it is only of subordinate importance for the function of the parts of the FLM-machine which form object of the present invention. It consists of a glue store **31**, a feeder flute **32**, leading to a gluing transport roller **33**, a rub-off ruler **34** for rubbing off any surplus

on this roller and two resiliently loaded support rollers **35, 36**, said rollers being arranged so that they press from below the blank of cardboard upwardly onto the gluing transport roller **33**. A given time is required for the glue to penetrate well into the material of the blank of cardboard, and for that reason this is further carried on between a pair of guide rulers **37, 38**, after passing the glue work to the attachment place of the pieces of the lining tube.

The lining tube is obtained from a store roller **39**. It passes in a known manner from a pulley roller **42** with a counter roller **43**, a folding work **44** in which it is folded from even strip-form into tube form and to a welding work or gluing work **45**, in which the tube is joined together along its longitudinal joint. From over a redirectional roller **46**, the lining tube is carried on to the cutting and mounting roller **47**. The roller **47** is provided with a number of openings on its outer surface, connected to a vacuum conduit so that the lining can be sucked rigidly to the outer surface of the roller. In this position the lining tube is cut in predetermined pieces, adapted to the blanks of cardboard in the way further exemplified in the above preamble of the specification whereby no double cuts between adjacent pieces are necessary. The cutting device is indicated schematically in the form of a knife **48** with a magnetic control device **49**. A ruler **52** is arranged for guiding the pieces of lining into correct position in relation to the entering blanks of cardboard. The blanks of cardboard are provided with a lining at **53**, but are not folded into tube form until after leaving contact with the roller **47** together with their linings. In order to retain the blanks and linings in correct position, a press roller **54** is provided.

The subsequent operational parts of the FLM-machine have no connection with the present invention, and their functioning procedure shall therefore only be mentioned in short terms. From the pair of rollers **47, 54** the blank of cardboard together with the lining hose glued thereto is thus carried on into a folding work where the blank of cardboard is folded in two places, corresponding to two diagonally placed corner creasings of the formed package and the two edges thereby meeting each other are glued together. The package is thereafter ready for delivery.

It will be evident from the above that the tube of lining is produced in advance in the folding work **44** and the welding work **45** and is cut in adapted pieces on the surface of the roller **47** with the aid of the knife **48**. The consequence hereof will be that if the roller **47** should be in continuous rotation, which is desirable with respect to the demand for a high speed of production, then the lining material will also be fed continuously to the place **53** for its attachment to a blank of cardboard even if the lining material should be divided in adapted pieces. It is then also obvious that it is necessary to convey the blanks of cardboard to the attachment place **53** in a carefully assumed position in the longitudinal direction of the machine as already explained above. There is no difficulty to fix the position of the conveyor chain **24** with sufficient exactness relative to the rotation of the roller **47** and thereby also in relation to the pieces of the hose of lining, nor is there any difficulty to provide the catchers **20–23** in the correct position in relation to the chain **24**. The difficulty has been to ensure that the blanks of cardboard will really assume an exactly correct position, supported towards a subsequent catcher, and that in no case such great lag shall occur to the blanks of cardboard that their lower edge or back end follows the face of a catcher.

Reference again being made to the example of dimensions, the length of each cardboard blank inclusive of the closing flaps may be 197 millimeters and the length of the corresponding lining is 220 millimeters so that a difference of only 23 millimeters exists. From this difference the length of the catchers in the conveying direc-

tion must be deducted: said catchers should, in order to be sufficiently stable, have a length of 13 to 15 millimeters. The free space, within which the position of the cardboard blank may vary, when it is introduced to the catchers **20–23** on the chain **24** is thereby reduced to only 8 to 10 millimeters. This length is so insufficient that, even if one should make the parts of the machine before said chain **24** with such accuracy that the distance might be kept, some blanks of cardboard would still cause difficulties within the double folding zone, thereby being displaced erroneously and perhaps stop the machine.

In order to remedy this difficulty two rollers **60** and **61** are placed relatively to the redirectional roller **25** of the chain **24**. In the practical form the rollers **25**, **60** and **61** are situated in the same cross section of the machine, but to simplify explanation these rollers have been shown somewhat displaced in FIGS. 3–6 with roller **61** being slightly reduced in size. This, however, has no deteriorating influence on the function of the machine.

The rollers **60** and **61** rotate with a peripheral speed considerably higher than the speed of the chain **24**, thereby causing the abovementioned acceleration of each of the cardboard blanks for contacting with its front edge the back of the catcher next ahead, as shown in FIG. 3. Meanwhile another cardboard blank **63** is conveyed by the belts **11** and **16** driven by the rollers **12** and **15** in an uncontrollable distance x from the preceding catcher. In FIG. 3 the distance x has been shown to be greater than the play between the length of the cardboard blank, on the one hand, and the distance between the releasing edge of a preceding catcher and the meeting edge of a following catcher, on the other hand. The consequence will be that if the cardboard blank **63** is not displaced forwardly with a higher speed than the normal conveying speed, its rear edge will not be caught by the following catcher **22** but will be placed over this catcher and an erroneous transverse mounting of the piece of lining hose on the cardboard blank will then also take place. In FIG. 3 the last mentioned play is indicated by y.

In FIG. 4 the cardboard blank **62** has entered under the influence of the friction rulers **18**, **19** as shown in FIG. 2, whereby it is braked so that its rear edge will contact the front of the catcher **21**, simultaneously as its front edge loses its contact with the back of the catcher **20**. The cardboard blank **63** approaches the accelerator **60**, **61** but is still at the distance x from the back of the catcher **21**, said distance being greater than the play y.

The cardboard blank **62** is now conveyed further into exact position whereas the cardboard blank **63** is thrown forwardly by the accelerator as shown in FIG. 5 at the same time as a further cardboard blank **64** is approaching, driven forwardly by the belts **11** and **16** to be later caught by the catcher **23**.

Finally, FIG. 6 shows the cardboard blank **63** to be braked by the rulers **18**, **19** so that its rear edge contacts the catcher **22**, whereas the cardboard blank **64** has just arrived under the influence of the accelerator rollers **60**, **61** but has not yet had sufficient time to be thrown forwardly into contact with the back of the catcher **22**. In order that rollers **60**, **61** may resiliently rest against each other, roller **60** is preferably rubber or rubber faced, while roller **61** is metallic.

It will be evident from the above explanation of the invention that the cardboard blanks, by the entering acceleration until their front edges contact the back of the preceding catcher and the retardation following thereafter so that their rear edges contact the front of the subsequent catcher, will be fed into correct positions with complete reliability. Consequently the pieces of the lining will be applied in a correct way on the cardboard blanks in spite of the fact that the lining pieces are conveyed with the highest possible tightness in sequence after each other, viz. in a contiguous succession, caused by the single cut of the knife **48**. Hereby one of the two circumstances, limiting the maximum working speed of the machine, has been brought to its optimum value and the working capacity of the machine will thereafter be limited exclusively by the highest rotational speed that is allowed for the different existing rollers.

What I claim is:

1. In a forming machine for the production of lined packages in which an outer blank is to be conveyed with even spacing over a first path, and the lining is shaped in tubular form and conveyed over a second path to be combined with the blanks after having been cut into pieces for corresponding blanks; the improvement comprising:
   - means for feeding a web of tubular lining material to the second path and means for cutting the web with longitudinally spaced, single transverse cuts to form individual and contiguous lining pieces;
   - an endless belt defining the first path and means for moving the belt at a speed equal to the speed of the moving lining pieces;
   - a plurality of catchers attached to the outer surface of the belt and spaced from each other along the belt at a predetermined distance equal to the length of each of the lining pieces;
   - means for feeding the blanks individually on to the moving belt at one end thereof;
   - means for grasping the leading edge of each outer blank after the feeding means and accelerating the outer blank at a speed faster than the speed of the belt until the front edge of the blank contacts the back of a catcher next preceding it;
   - means for transversely aligning the blank on the belt and causing a renewed lag of the blank until the back edge of the blank contacts the front of a catcher next subsequent, the blank being further conveyed along the first path with the aid of the said subsequent catcher; and
   - means for joining each blank with a corresponding lining at a converging of the belt and the second path.

2. The improvement according to claim 1 wherein the means for accelerating comprises a pair of oppositely rotating rollers between which the belt and blanks move, the peripheral of said rollers being greater than the speed of the belt.

3. The improvement according to claim 2 wherein one of said rollers is at least rubber faced and the rollers rest resiliently against each other and are separable to enable a catcher to pass therebetween.

4. The improvement according to claim 2 wherein the means for transversely aligning and causing the renewed lag comprises at least one friction ruler engaging the blank and thereby slowing its movement along the first path to a speed lower than the speed of the belt.

5. In a machine for forming packaging material of outer blanks and inner liners, the combination comprising:
   - means for feeding a web of lining material at a fixed speed along a first path,
   - means on the path for cutting the web at a predetermined spacing into separate liners,
   - a belt and means for moving the belt at the said fixed speed along a second path converging with first path, a plurality of catchers spaced at a predetermined distance along said belt, the said distance being equal to the spacing of the cutting,
   - means for delivering blank individually to said belt,
   - means for grasping the leading edge of each blank after it has been delivered on to the belt and accelerating the blank to a speed greater than the fixed speed of the belt until the front edge of the blank contacts the back of a catcher next preceding it,
   - means for transversely aligning the blank on the belt and retarding the blank to a speed lower than said fixed speed until the back edge of said blank contacts the front of a catcher next subsequent to it,
   - means to join each blank with a corresponding liner at the converging of the first and second paths.

6. The combination according to claim 5 wherein the means for accelerating comprises a pair of oppositely rotating rollers between which the belt and blank moves, the peripheral speed of said rollers being greater than the fixed speed of said belt.

7. The combination according to claim 6 wherein one of said rollers is at least rubber faced and the rollers rest resiliently against each other and are separable to enable a catcher to pass therebetween.

8. The combination according to claim 6 wherein the means for transversely aligning and retarding the blank comprises at least one friction ruler engaging the blank and thereby slowing its movement to a speed lower than the fixed speed of said belt.

9. The combination according to claim 5 wherein the belt is an endless belt passing around two redirectional rollers, and both the delivering means and the accelerating means are positioned at one end of said belt at one of the redirectional rollers.

10. The combination according to claim 9 wherein the blank is accelerated before the subsequent catcher passes around the said one of said redirectional rollers.

11. The combination according to claim 9 wherein the blank is retarded after the subsequent catcher passes around the said one of said redirectional rollers.

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