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H. W. HUFFMAN

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CAMMED TUCKER-BLADE FOLDER

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FIG-2

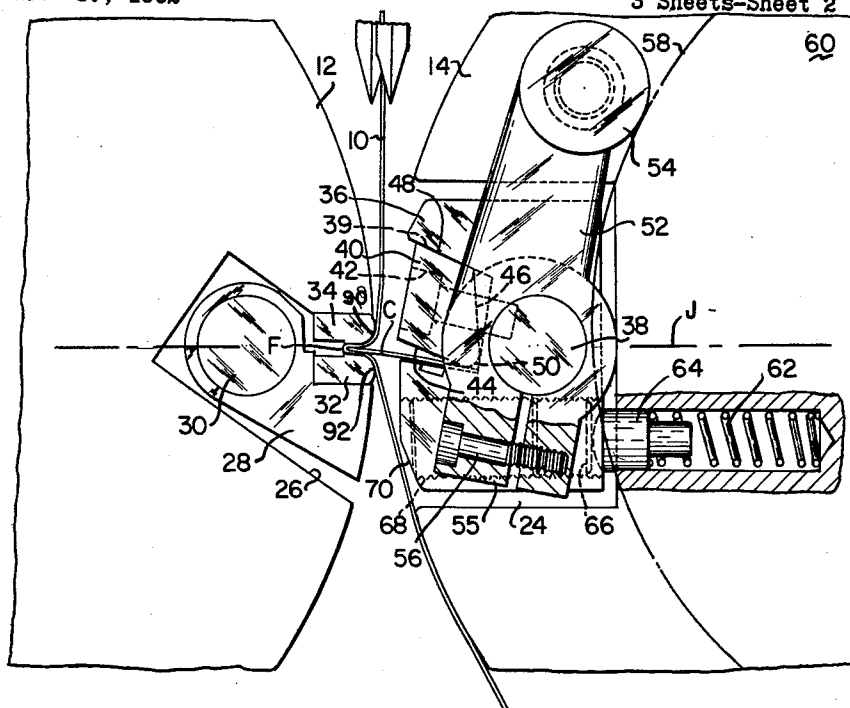
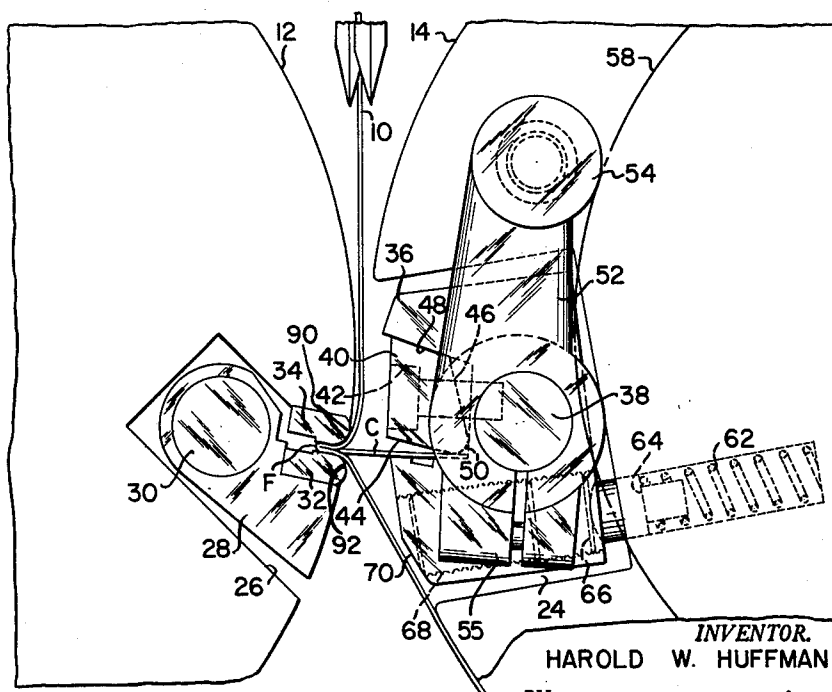


FIG-3



INVENTOR.
HAROLD W. HUFFMAN

BY *James Kinney*
ATTORNEY

3,124,349

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BY *William Finney, Jr.*
ATTORNEY

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CAMMED TUCKER-BLADE FOLDER

Harold W. Huffman, Hamilton, Ohio, assignor to The Hamilton Tool Company, Hamilton, Ohio, a corporation of Ohio

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This invention relates to a cammed tucker-blade folder.

An object of the invention is to provide means for automatically controlling and correlating the movement of a tucker blade, the tip of which projects beyond the periphery of a carrier cylinder, with the action of the folder jaws of a second carrier cylinder for preventing the paper web from acquiring or taking a permanent set adjacent the fold thereof incident to a fold-forming operation.

Heretofore a crease has been created transversely of a paper web parallel with and adjacent to the fold formed therein by a tucker blade while inserting a fold of paper web between a pair of folder jaws secured to and carried by a second carrier cylinder rotating at the same rate as the blade-carrying cylinder. The corners on the folder jaws created a crease in the paper adjacent the transverse fold, and the presence of this crease has caused difficulty when such webs have been used in automatic business equipment. One of the objects of the present invention is to provide a radius on the folder jaws for preventing the paper web from acquiring permanent set; that is, the paper will not be tensioned beyond its elastic limit during the folding operation.

Still a further object of the invention is to provide simple yet highly effective means for automatically shifting the relationship of a tucker blade relative to its carrier cylinder from the fully advanced position therewith as it initially enters the folder jaws to a fully retarded position as it leaves said jaws for the purpose of correlating the tip speed of the tucker blade relative to the tip speed of said jaws. In this connection it should be understood that the tip speed of the tucker blade is faster than the tip speed of the mating folder jaws of the other cylinder because the tip of the tucker blade projects outwardly beyond the pitch diameter of its carrier cylinder, whereas the folder jaws of the other cylinder are below the pitch diameter of their carrier cylinder. The relationship of the tucker blade is continuously and automatically retarded from the advanced position in which it initially engages the folder jaws in such a manner as to remain in phase with said jaws during the period of time when the tucker blade is in engaging relationship with said folder jaws.

These and other objects are attained by the means described herein and as disclosed in the accompanying drawings, in which:

FIG. 1 is an end view taken on line 1-1 of FIG. 4, illustrating a pair of folding cylinders embodying the teachings of the present invention.

FIGS. 2 and 3 are enlarged, fragmentary views illustrating the sequential phase relationship between the tucker blade and folder jaws during the balance of the web-folding operation, the first step of which is illustrated in FIG. 1.

FIG. 4 is a view taken on line 4-4 of FIG. 1.

With reference to FIG. 1, the numeral 10 denotes generally a continuous web of paper which is to be provided with alternate zig-zag folds, as 22 and 24, which are formed as the web passes between folding cylinders 12 and 14 suitably mounted by means not pertinent to the present invention for rotation about centers "A" and "B," respectively.

The folds 22 and 24 are provided in web 10 by means of a tucker blade "C," carried by one of the folding cylinders, which is caused to engage and insert the paper web into

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and between a pair of folder jaws 32 and 34 carried by the other folding cylinder.

In FIG. 1 I have illustrated a two-around folder, although it should, of course, be understood that such a folder may be of the four-around variety if desired.

By two-around is meant that two folds will be imparted to web 10 for each complete revolution of the folding cylinders 12 and 14, wherein the folds 24 will be formed by tucker blade "C" whereas folds 22 will be imparted by tucker "D."

Each of the folding cylinders 12 and 14 are provided with a pair of transverse slots 24 and 26; wherein transverse slots 24 accommodate the tucker blade assemblies and transverse slots 26 accommodate the clamp or folder jaw assemblies.

The numeral 28 denotes a holder for the jaw inserts; said holders being pivotally mounted for movement about axis 30. Replaceable insert jaws 32 are fixedly though removably mounted to holder 28 by means of screws, or the like, not illustrated. A stationary insert jaw 34 is secured to and carried by the cylinder by screws, not illustrated.

The jaw holder 28 and jaws 32 are movable between the full open position illustrated in FIG. 1 to the fully closed position illustrated in FIGS. 2 and 3 relative to the stationary jaw 34. The present invention is neither concerned with nor directed to the particular means by which the jaw insert and jaws 32 and 34 are secured relative to one another and/or are mounted for relative movement, since this feature is well known in the art.

The jaws 34 and 32 are provided with opposing curved corners 90 and 92 respectively, which function to guide blade C and web 10 between the jaws without creasing the web except at point F.

The numeral 36 denotes a bar carrier for the tucker blade "C;" said bar carrier being transversely disposed of a cylinder and being received in transverse slot 24 thereof.

The bar carrier is suitably mounted for pivotal motion about axis 38 of the bar carrier. The outer face of bar carrier 36 is provided with an elongate transverse slot 39 (FIG. 2) for receiving the tucker blade clamp bar 40, which is secured to the bar carrier by means of bolts 42. It will be noted that the tucker blade clamp bar includes forward, bottom and rear faces 44, 46 and 48, respectively, wherein the adjacent edges of the front and bottom faces are interconnected by a rounded surface 50. When the tucker blade clamp bar is urged downwardly into slot 39 by bolt 42 the rear face 48 thereof will engage the inclined rear surface of the recess 39, which will automatically effect a forward movement of the clamp bar whereby the lower portion 50 of the front face 44 will clampingly engage the lowermost end of the tucker blade "C." The inclined forward wall 44 of the tucker blade clamp bar provides an area immediately above or outwardly of the location where the tucker blade is clamped relative to the bar carrier for permitting the tucker blade to flex or move about its locus of connection.

An actuating arm 52 is secured to and carried by an extension of pivotal axis 38, being secured thereto by means of a clamp 55 and a clamping bolt 56, whereby actuating arm 52 may be moved relative to and about pivotal axis 38 for shifting the tucker blade clamp bar assembly or the bar carrier for the tucker blade relative to and about pivotal axis 38. A follower 54 is rotatably secured to and carried by the free outer end of actuating arm 52, said follower adapted to ride upon the camming surface 58 of a cam 60.

In the preferred embodiment of the invention, suitable means are provided for normally and yieldably urging follower 54 into contacting relationship at all times with camming surface 58 of the cam. Such means may, by way of example, comprise a spring 62 bearing against a plunger 64, which in turn bears against an adjacent base

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face 66 of a screw 68 which is threadably engaged into a bore of the bar carrier 36, as illustrated in dotted outline; said axial bore being indicated generally by the numeral 70.

With particular reference now to FIG. 1, it will be noted that the free end of tucker blade "C" has just engaged the web 10 and has started to insert and form a fold in the web which is being introduced between the open jaws 32 and 34. Particular note should be taken of the fact that the fold is being initially formed with the tucker blade above a center line or axis extending through centers "A" and "B" of cylinders 12 and 14. It will be further noted that the tucker blade "C" is extending or disposed relative to cylinder 14 in such a manner that if a line be drawn rearwardly through the tucker blade it will miss, that is, extend below, center of rotation "B" of cylinder 14. This relationship of inclination of the tucker blade is present in all the phases illustrated in FIGS. 1, 2 and 3.

At this point it should be noted that the cams 60, see FIG. 4, are fixedly secured to and carried by the inner face of housing 90 by bolts 62, wherefore the cams will be stationary and cylinders 12 and 14 and their respective tucker blade assemblies and jaw assemblies will rotate relative to the stationary cams.

With reference now to FIG. 1, and comparing this figure to FIG. 2, it will be noticed that as cylinder 14 is rotated in a counter-clockwise direction about center "B," follower 54 will engage the cam surface 53, which surface is disposed whereby to impart a clockwise rotation to the bar carrier 36; and this relationship will cause the tucker blade to be retarded as the cylinder 14 is rotated relative to cylinder 12.

With reference now to FIG. 2, it will be noted that the outer forward or free end of tucker blade "C" is in its fully advanced position between jaws 32 and 34, which have been moved to closed position for engaging the outer faces of the web, which web is literally squeezed onto the opposite faces of the tucker blade "C" for imparting and defining a clean transverse fold line "F" to the web.

It should be noted that in FIG. 1 the centers 30 and 38, respectively, of the jaw clamp bar assembly and tucker blade assemblies, respectively, are disposed in advance of—that is, above—a line drawn through centers "A" and "B" of the cylinders 12 and 14. In FIG. 2, these centers 30 and 38 are illustrated in axial alignment with centers "A" and "B" of cylinders 12 and 14; whereas in FIG. 3 centers 30 and 38 are below an axis through centers "A" and "B" of rolls 12 and 14 by an amount approximating the distance by which these centers are above said axis in FIG. 1.

The paper-gripping portions or surfaces of each of jaws 32 and 34 are constructed in such a manner as to have a better or higher coefficient of friction with paper web than the coefficient of friction between the paper web and blade "C" in order that the blade may be withdrawn from its position of FIG. 2 relative to the fold "F" in the web without accidentally or unintentionally pulling said fold outwardly from its relationship between jaws 32 and 34.

In FIG. 2 it will also be noted that the free outer tip of the tucker blade "C" is also disposed on a line passing through centers "A" and "B" of cylinders 12 and 14 and through centers 30 and 38 of the jaw assembly and tucker blade assemblies, respectively.

The angularity of the cylinders will result in the outer end of tucker blade "C" being withdrawn from fold "F," as evident from a comparison of FIGS. 2 and 3, and the spring or yielding means by which jaw 32 is urged normally toward fixed jaw 34 will automatically close onto the fold as the tucker blade is withdrawn therefrom, as illustrated in FIG. 3. Jaws 32 and 34 will positively retain fold "F" for approximately another 45° rotation of cylinder 12, at which time the jaws will be automatically opened by suitable camming means, old in the prior art.

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The fold thus formed in web 10 will then be automatically laid onto the other folds 24 illustrated in FIG. 1. As cylinders 12 and 14 are further rotated, as indicated by the headed arrows of FIG. 1, folds 22 will next be imparted into web 10 by the action of the tucker blade assembly "D" of cylinder 12 and its engaging relationship with clamping jaws of the other cylinder 14.

From the foregoing, it will be noted that I have thus provided simple, yet highly effective and fully automatic means for retarding the tip speed of the tucker blades by automatically and synchronously moving the tip of the tucker blade in opposition to the direction of travel of the cylinder with which it is associated during those periods of time when the tucker blade is operatively performing a folding operation in the web. Uniformly satisfactory results have been obtained in those instances in which the aforesaid retarding action occurs through approximately 30°—that is, while the blade is moving through an arc in advance of the position illustrated in FIG. 1 to a position after that illustrated in FIG. 3. It will, of course, be understood that during those periods of time when the follower is being advanced onto the larger diameter of the cam surface 53, the tip speed of the tucker blade will be increased in order to achieve its relative advanced position, as illustrated in FIG. 1, for the next tucking operation.

With reference now to FIG. 1, the letter J denotes a common axis extending through the axis of rotation of carrier cylinders 12 and 14.

In FIG. 2 a so-called neutral position has been illustrated wherein the tip of blade C and the axes 30 and 38 about which the jaw carrier 28 and blade carrier 36 are movable are adjacent each other and disposed on an axis J extending through the axis of rotation of carrier cylinders 12 and 14.

In FIG. 1 the blade carrier 36 has been rotated via shaft 30 in a counter-clockwise direction for moving the forward tip of blade C to a fully advanced position in the direction of cylinder rotation; said blade being initially presented to the jaws 32 and 34 in this fully advanced position when the axis of shaft 38 is approximately 10 degrees above or ahead of axis J. In the preferred embodiment of the invention, the relationship of the camming surface is such that the tip of the tucker blade C will have been rocked axially by approximately four degrees ahead of the neutral position illustrated in FIG. 2.

By comparing FIGS. 1, 2 and 3, it will be noted that blade carrier 36 and blade C are automatically and continuously rotated in a clockwise direction via shaft 38 for moving the tip of the blade to the fully retarded position of FIG. 3; that it, during those periods of time when the blade is in a web-folding relationship with the folder-jaws of the companion carrier cylinder.

The axis of shaft 38, in FIG. 3, has been illustrated approximately 10 degrees below or past axis J and the tip of the tucker blade has been rocked axially about three degrees but not more than four degrees behind the neutral position illustrated in FIG. 2.

It will, of course, be understood that after the tucker blade has been rotated whereby to completely clear web 10, the cam will actuate arm 52 whereby to advance the blade C, and blade carrier 36 to the fully advanced position illustrated in FIG. 1 preparatory to the next web folding cycle.

What is claimed is:

1. In a cammed, tucker-blade folder, the combination of a pair of carrier cylinders rotatably mounted adjacent to one another, a tucker blade movably secured to and carried by one of said cylinders with the tip of the blade projecting from the periphery of said one cylinder, a pair of web-receptive folder-jaws secured to and carried by the other cylinder with the throat of said jaws located inwardly of the periphery of said cylinder, means rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between,

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and retracting it from said jaws, operating means operatively connected to at least one of said jaws adapted to close said jaws on the tip of the blade and a portion of said web after insertion therebetween, and means for moving the tucker blade relative to said one carrier cylinder for maintaining the tip of the blade in phase with the folder-jaws while engaged by said jaws.

2. In a cammed, tucker-blade folder, the combination of a pair of rotatably mounted carrier cylinders, each having an elongate slot in its periphery extending the full width thereof, a tucker blade, an elongate tucker blade carrier, means movably mounting said blade carrier in the slot of one of the cylinders for movement about an axis parallel to the axis of the cylinder, means mounting said blade to said blade carrier with the tip of the blade projecting from the periphery of the cylinder, a pair of elongate web-receptive folder-jaws received in the slot of the other cylinder with the throat of said jaws located inwardly of the periphery of said cylinder, means rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between, and retracting it from said jaws, means for closing said jaws on the tip of the blade inserted therebetween, and means for moving the blade carrier relative to its cylinder for initially presenting the blade to said jaws with the tip thereof in advanced position relative to its cylinder, and of continuously retarding the tip speed of the blade while engaging said jaws for maintaining the tip of the blade in phase with said jaws.

3. In a cammed tucker-blade folder, the combination of a pair of laterally spaced rotatably mounted carrier cylinders, a tucker blade secured to, carried by and having a tip projecting from the periphery of one of said cylinders, and a pair of web-receptive folder-jaws secured to and carried by the other cylinder, each of said jaws terminating in an outer elongate, rounded forward edge, with those portions inwardly of and immediately adjacent said rounded edges defining the web creasing portions of said jaws, said pair of jaws defining a blade-receptive throat all portions of which are disposed inwardly of the periphery of said other cylinder, means driving said cylinders in timed relationship for presenting the tip of the tucker blade to, between and retracting it from said jaws, and means for maintaining the tip of said tucker blade in phase with the folder jaws for correlating the tip speed of said blade to the rate of travel of said jaws during those periods of time when the blade tip is in contacting relationship with any portion of either of said jaws.

4. In a cammed, tucker-blade folder, the combination of a pair of rotatably mounted carrier cylinders, each having an elongate slot in its periphery extending the full width thereof, a tucker blade, an elongate tucker blade carrier, means mounting said blade carrier in the slot of one of the cylinders for movement about an axis parallel to the axis of said one cylinder, means mounting said blade to said blade carrier with the tip of the blade projecting from the periphery of the cylinder, a pair of elongate web-receptive folder jaws, an elongate jaw carrier, means fixedly mounting one of said jaws in the slot of the other cylinder, means mounting said jaw carrier in the slot of said last mentioned cylinder for movement about an axis parallel to the axis of said cylinder, means mounting the other of said jaws to said jaw carrier for movement toward and from the other jaw, means rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between, and retracting it from said jaws, means for closing said jaws on the tip of the blade inserted therebetween, said blade and jaw carriers being in a neutral position when the axes about which said carriers are movable are adjacent each other and disposed on an axis extending through the axis of rotation of said carrier cylinders, means for moving the blade carrier in a counter-clockwise direction relative to its neutral position for initially presenting the blade to said jaws with the tip

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thereof in advanced position relative to its cylinder, and means for then imparting a clockwise movement to the blade carrier for moving it to and beyond its neutral position for continuously retarding the tip speed of the blade while engaging said jaws and for maintaining the tip of the blade in phase with said jaws.

5. In a cammed, tucker-blade folder, the combination of a pair of rotatably mounted carrier cylinders, each having an elongate slot in its periphery extending the full width thereof, a tucker blade, an elongate tucker blade carrier, means mounting said blade carrier in the slot of one of the cylinders for movement about an axis parallel to the axis of the cylinder, means mounting said blade to said blade carrier with the tip of the blade projecting from the periphery of the cylinder, a pair of elongate web-receptive folder jaws, an elongate jaw carrier, means fixedly mounting one of said jaws in the slot of the other cylinder, means mounting said jaw carrier in the slot of said last mentioned cylinder for movement about an axis parallel to the axis of said one cylinder, means mounting the other of said jaws to said jaw carrier for movement toward and from the other jaw, means rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between, and retracting it from said jaws, means for closing said jaws on the tip of the blade inserted therebetween, said blade carrier and said jaw carrier being in a neutral position when the tip of the blade and the axes about which said carriers are movable are adjacent each other and disposed on a common axis extending through the axis of rotation of said carrier cylinders, means for moving the blade carrier about its axis for shifting the blade tip forwardly in the direction of cylinder rotation to a fully advanced position with reference to the position of said tip when the blade carrier is in neutral position for presenting the tip of the blade to said jaws in advanced position, and means operative for continuously moving said blade carrier about its axis for moving the tip of the blade relative to and in opposition with the direction of rotation of said cylinder from a fully advanced to a fully retarded position during those periods of time when the blade is in a web-folding relationship with the folder-jaws of the other carrier cylinder.

6. A folder as described in claim 5, wherein the blade is inclined downwardly from the tip thereof at an angle of from 10° to 12° from the common axis when said blade and jaw carriers are in neutral position.

7. A folder as described in claim 5, wherein the blade carrier is moved about its axis throughout an arc of approximately four degrees above and below its neutral position incident to movement of the blade tip from fully advanced to fully retarded position.

8. The combination of a pair of rotatably mounted carrier cylinders, a tucker blade secured to, carried by and having a tip projecting from the periphery of one of said cylinders, a pair of web-receptive folder-jaws secured to and carried by the other cylinder, each of said jaws terminating in an outer elongate, rounded forward edge and having portions inwardly of and immediately adjacent said rounded edges defining web creasing portions of said jaws, means rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between, and retracting it from said jaws, means for closing said jaws on the tip of the tucker blade inserted therebetween, said tucker blade and jaws being in neutral position when the tucker blade has been fully received within said jaws, means for moving said tucker blade in advance of said neutral position in a clockwise direction relative to its cylinder for initially presenting to said jaws with the tip thereof in fully advanced position relative to its cylinder, and means for imparting a clockwise movement to said tucker blade for moving it to and beyond its neutral position for continuously retarding the tip speed of the blade relative to

the peripheral speed of its cylinder when said blade engages said jaws.

9. In a cammed, tucker-blade folder, the combination of a pair of carrier cylinders rotatably mounted adjacent to one another and spaced apart so that a flexible web to be folded may be moved between said cylinders, a tucker blade movably secured to and carried by one of said cylinders with the tip of the blade projecting from the periphery of said one cylinder, a pair of web receptive folder jaws secured to and carried by the other cylinder with the throat of said jaws located inwardly of the periphery of said cylinder, means operatively connected to and rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between and retracting it from said jaws, operating means operatively connected to at least one of said jaws adapted to move said jaws apart a distance substantially greater than the combined thicknesses of two of said webs and the projecting portion of said tip before said tip is inserted between said jaws, said operating means closing said jaws on the tip of the blade after the blade and a portion of said web is inserted therebetween, said operating means further closing said jaws after said tip has been withdrawn from between said jaws so as to grip and crease said web, said operating means maintaining said jaws closed on said web until said other cylinder has rotated substantially at least 45° after said tip has been withdrawn from between said jaws, and means for moving the tucker blade relative to its carrier cylinder for maintaining the tip of the blade in phase with the folder jaws while engaged by said jaws, a groove formed in said one cylinder being of generally rectangular cross section, an elongated bar of smaller cross section than said groove pivotally mounted therein on a pivot axis parallel to the axis of rotation of said one cylinder, the outer surface of said bar being substantially flush with the outer surface of said one cylinder, said other surface having an elongated recess therein having a wall surface below said pivot axis extending generally radially in relation to the axis of said one cylinder, the radially inner edge portion of said tucker blade supported flat against said wall surface, a clamp bar secured in said recess, said clamp bar having a lower rounded corner engaging the inner edge of said tucker blade and clamping it against said wall surface, and said clamp bar having a surface extending radially outwardly from said rounded corner and diverging from said tucker blade whereby said tucker blade may pivot and flex about said rounded corner, the means for moving said tucker blade including stationary cam means and an arm secured to said bar extending

upwardly therefrom, spring means urging the upper end of said arm in engagement with said cam means and maintaining said tucker blade at an angle of 10 to 12° with a plane passing through the axes of said cylinders when the tucker blade lies within said plane.

10. In a cammed, tucker-blade folder, the combination of a pair of carrier cylinders rotatably mounted adjacent to one another and spaced apart so that a flexible web to be folded may be moved between said cylinders, a tucker blade movably secured to and carried by one of said cylinders with the tip of the blade projecting from the periphery of said one cylinder, a pair of web receptive folder jaws secured to and carried by the other cylinder with the throat of said jaws located inwardly of the periphery of said cylinder, means operatively connected to and rotating said cylinders in timed relationship for sequentially presenting the tip of the tucker blade to, inserting it between and retracting it from said jaws, means for moving the tucker blade relative to its carrier cylinder for maintaining the tip of the blade in phase with the folder jaws while engaged by said jaws, a groove formed in said one cylinder being of generally rectangular cross section, an elongated bar of smaller cross section than said groove pivotally mounted therein on a pivot axis parallel to the axis of rotation of said one cylinder, the outer surface of said bar being substantially flush with the outer surface of said one cylinder, said other surface having an elongated recess therein having a wall surface below said pivot axis extending generally radially in relation to the axis of said one cylinder, the radially inner edge portion of said tucker blade supported flat against said wall surface, a clamp bar secured in said recess, said clamp bar having a lower rounded corner engaging the inner edge of said tucker blade and clamping it against said wall surface, and said clamp bar having a surface extending radially outwardly from said rounded corner and diverging from said tucker blade whereby said tucker blade may pivot and flex about said rounded corner, the means for moving said tucker blade including stationary cam means and an arm secured to said bar extending upwardly therefrom, spring means urging the upper end of said arm in engagement with said cam means and maintaining said tucker blade at an angle of 10 to 12° with a plane passing through the axes of said cylinders when the tucker blade lies within said plane.

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