United States Patent

Grantham et al.

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[54] **LAUNDRY FOLDER WITH WICKET CLAMP**

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[52] **U.S. Cl.** **270/62,** 270/45, 271/66, 271/70

[51] **Int. Cl.** **B65h 45/12**

[58] **Field of Search** 271/66, 70; 198/210; 270/58, 270/62, 45, 61

[56] **References Cited**

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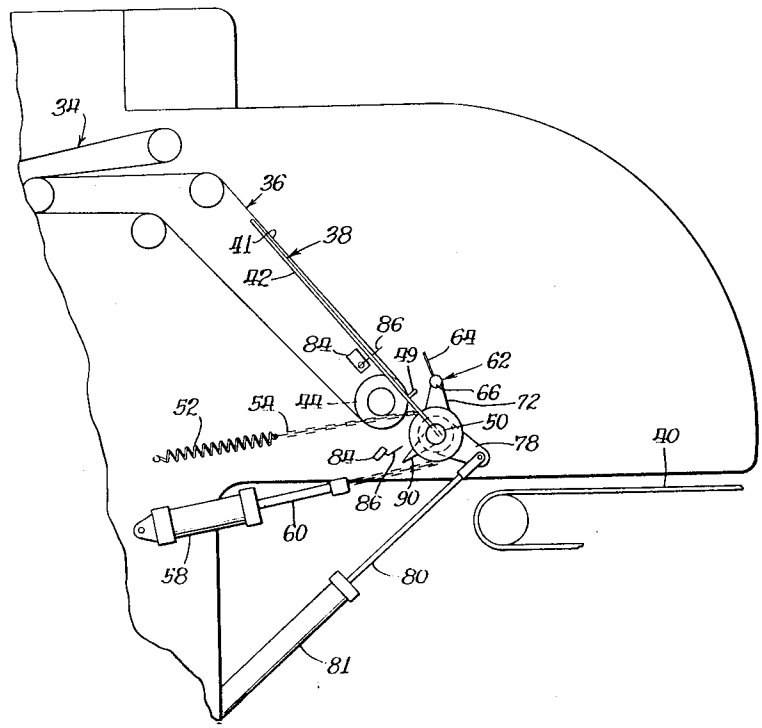
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Assistant Examiner—L. R. Oremland
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[57] **ABSTRACT**

A laundry folder having a wicket for positively placing the laundry pieces on a supporting surface after final folding, and a gripper blade for gripping the pieces on the wicket to hold them from flying off, and including operating means for releasing the gripper blade immediately upon the pieces being so placed so that the wicket can return without disturbing those pieces which have already been placed.

10 Claims, 9 Drawing Figures



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SHEET 1 OF 2

Fig. 1.

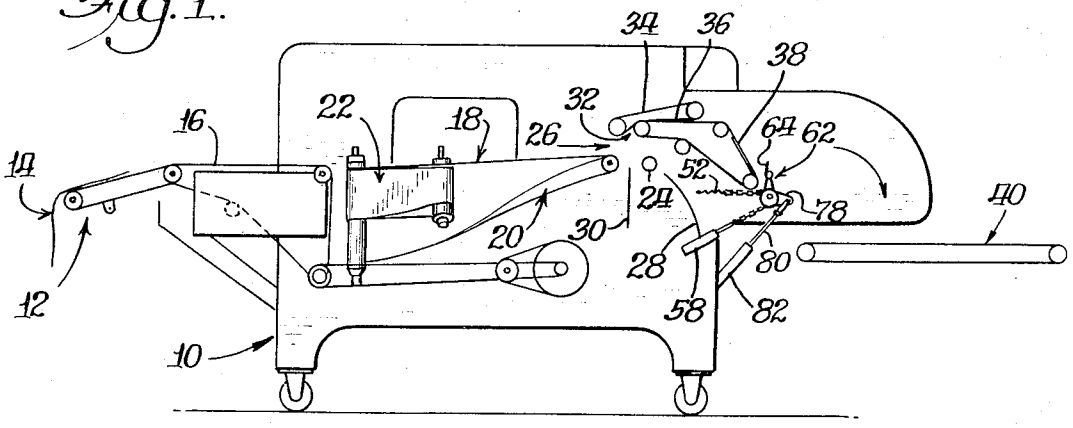
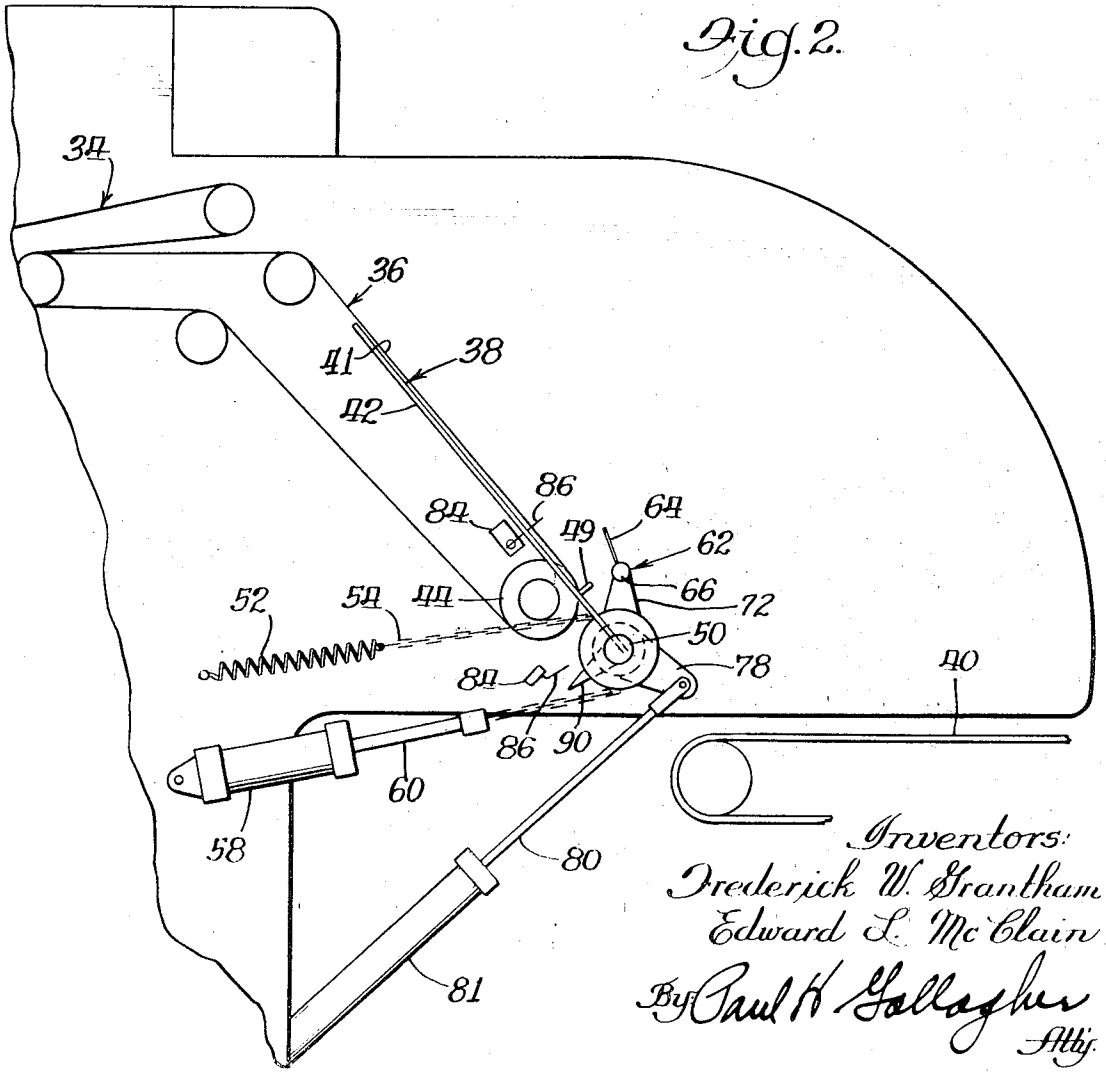


Fig. 2.



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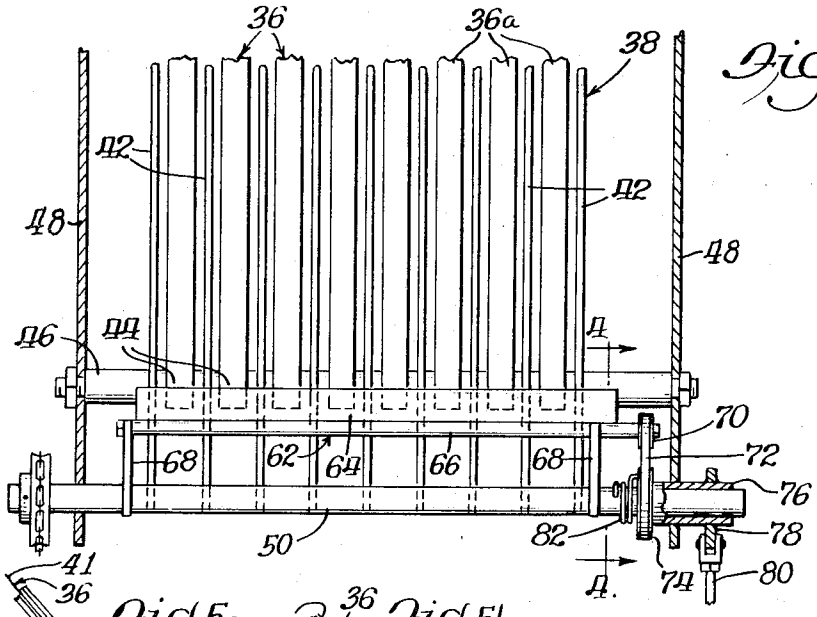


Fig. 3.

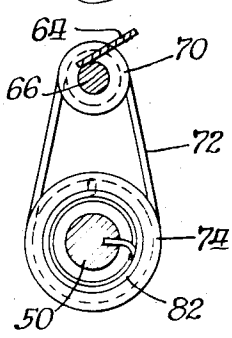


Fig. 4.

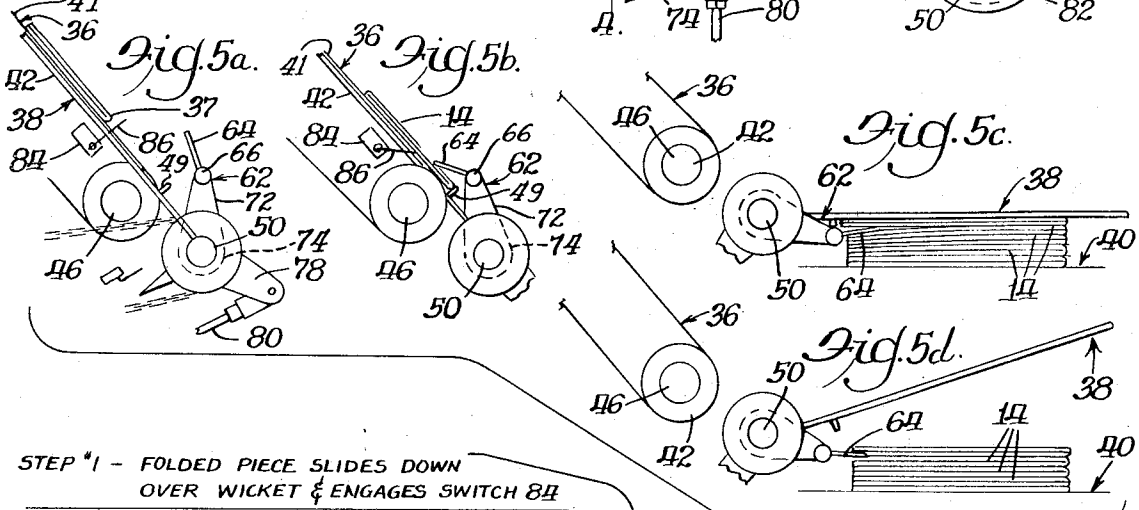


Fig. 5a. Fig. 5b. Fig. 5c. Fig. 5d.

Fig. 5.

STEP #1 – FOLDED PIECE SLIDES DOWN OVER WICKET & ENGAGES SWITCH 84

STEP #2 – GRIPPER CYLINDER 81 RELEASED & SPRING 82 MOVES GRIPPER BLADE INTO GRIPPING POSITION (FIG. 5b)

STEP #3 – WICKET CYLINDER 58 ENERGIZED & CONTRACTED, & IT SWINGS WICKET TO DOWN POSITION (FIG. 5c.)

STEP #4 – WICKET CYLINDER 58 RELEASED, & SPRING 52 MOVES WICKET TO UP RETRACTED POSITION.

STEP #5 – GRIPPER CYLINDER 81 ENERGIZED & CONTRACTED, & MOVES GRIPPER BLADE TO OPEN POSITION. THIS STEP MAY BE SUBSTANTIALLY SIMULTANEOUS WITH STEP #4

CYCLE COMPLETE, & REPEATED

Fig. 6.

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LAUNDRY FOLDER WITH WICKET CLAMP

FIELD OF THE INVENTION

The invention resides in the field of small piece laundry folders, for folding such pieces as towels, pillow cases, napkins, etc. and has to do more particularly with the smaller ones of those pieces such as napkins, handkerchiefs, etc., where it is sometimes difficult to form an accurate stack because of the lightness in weight, as contrasted to heavier pieces such as the bigger towels.

To accomplish such even stacking, a swinging wicket has been utilized heretofore, but there has always been a problem in retaining the pieces on the wicket because of their tendency to fly off of it as the wicket swings down to deposit or place them on a supporting surface as in a stack thereon.

OBJECTS OF THE INVENTION

A broad object of the invention is to provide a laundry folder for folding small pieces of the character referred to above, having a novel means for overcoming disadvantages referred to.

Another broad object is to provide in a folder of the foregoing character, having a wicket for placing the folded pieces in a stack, novel gripper means for holding the pieces on the wicket as the wicket moves down for so placing the pieces.

Another object is to provide a construction of the character just immediately referred to which includes means for gripping the pieces on the wicket quickly as the pieces are moved onto the wicket, and which quickly releases them immediately after the pieces are put on the stack and the wicket begins to retract.

Still a further object is to provide a small piece folder of the foregoing general character including a wicket for placing the folded pieces in a stack, in which the wicket swings about a transverse axis, and including a gripper blade for gripping the pieces adjacent the axis of swinging the wicket, which grips the pieces and prevents them from flying off the wicket which otherwise might occur because of the rapid swinging movement of the wicket, and further in which the gripper blade moves quickly into gripping position after each piece assumes its final position on the wicket, and in which the gripper blade moves out of its gripping position quickly after each piece is placed in the stack, and additionally in which the gripper blade is retracted from gripping position in generally longitudinal direction so as to avoid any possibility of disarrangement of the pieces in the stack.

DESCRIPTION OF A PREFERRED EMBODIMENT

In the drawings:

FIG. **1** is a side view, semi-diagrammatic in character, of a laundry folder embodying the features of the present invention;

FIG. **2** is a side view, of larger scale than FIG. **1**, and showing the exit end portion of the folder of FIG. **1**;

FIG. **3** is a fragmentary end view oriented according to line **3**—**3** of FIG. **2**;

FIG. **4** is a detail view taken at line **4**—**4** of FIG. **3**;

FIG. **5** including FIGS. **5***a* through **5***d* shows a number of detail views of elements of the stacking construction shown mostly in FIG. **2**, and in various positions of the different elements; and

FIG. **6** is a diagrammatic timing pattern indicating in a general way the various steps in the operation of the means for placing the pieces in a stack, including the gripping means.

Referring in detail to the drawings, attention is directed first to FIG. **1** showing a small piece folder of the general kind to which the present invention is particularly adapted. The folder in its overall construction may be similar to that shown in the patent of the present Frederick W. Grantham, U.S. Pat. No. 3,462,138, dated Aug. 19, 1969, to which attention is directed for detail construction. The folder includes a frame **10** having a feedboard **12** onto which the laundry pieces **14** to be folded are placed, and from which the pieces are delivered onto a vertical folding conveyor belt **16**, and from that conveyor belt the pieces are delivered to a conveyor means **18** which includes a twist belt **20** and a training belt or holding belt **22**, together taking the vertically folded piece from the conveyor means **16** and delivering at its delivery end (the right hand end FIG. **1**) in a horizontal position. As the piece thus folded is so delivered, it rides over a roller **24** forming a gap **26** with the main belt **20**, and the piece then rides down a curved apron **28** where it engages a control means (not shown) for actuating a folding knife **30** which engages the piece at an intermediate portion and delivers it into a bight **32** between a pair of conveyors **34**, **36**. The conveyor **34** includes an endless belt trained on a pair of rollers, and the conveyor **36** also is an endless belt trained on rollers, but which will be described more in detail hereinbelow.

The laundry pieces **14** are folded in a half-fold by the knife **30** forming a new leading edge **37** (FIG. **5***a*), and after being carried by and between the conveyors **34**, **36**, they ride down the far end of the conveyor **36**, as referred to again hereinbelow.

Associated with the conveyor **36** is a wicket **38** also described in detail hereinbelow, and which receives the pieces thus folded and throws them down onto a supporting surface **40** which is preferably and in most cases a conveyor. The present invention is directed to the wicket **38** and the means for clamping the laundry pieces thereon, independently of the folding means and the conveyor **40**.

The conveyor **40** may be of the type for example as disclosed in the pending application of the present Frederick W. Grantham Ser. No. 47,188 filed June 18, 1970, or it may be replaced by other form of table, consideration being that the conveyor **40** provides a supporting surface on which the folded pieces are placed by the wicket. Preferably the conveyor lowers as the pieces are placed thereon in a stack, so that the top piece is always at substantially the same height.

The conveyor belt **36** has a final run **41** disposed at a sharply inclined angle, over which the folded pieces slide and from which the wicket **38** takes the pieces and places them on the conveyor **40**. The conveyor belt **36** is made up of a plurality of belt elements **36***a* (FIG. **3**) and the wicket **38** includes a plurality of rods or bars **42** positionable between the belt elements **36***a* in a known manner. The belt elements **36** may be trained on pulley elements **44** on a roller **46**, the pulley elements being spaced apart axially to receive the wicket rods **42** therebetween which thus lie inwardly of the outer surface of the pulley elements, (FIG. **2**) and of the belt elements **36***a*. The rods **42** of the wicket are secured to a

shaft **50** as by welding, the shaft being mounted for rocking movement in suitable elements of the folder such as the side plates **48**. The wicket includes stop means **49** for limiting the laundry pieces in sliding down over the wicket.

The wicket is swingable between a retracted position as shown in FIG. **2** and advanced position shown in FIG. **5***c*, and is biased to retracted position by a tension spring **52** secured to a chain **54** or other flexible element trained over a pulley **56** on the shaft **50**. The wicket is swung to advanced (FIG. **5***c*) position by an air cylinder **58** of which the piston **60** is secured to the other end of the chain **54**. When the cylinder is inactive, the spring pulls the wicket up to retracted position.

The construction includes a gripper blade **62** which includes a blade element **64** secured to a shaft **66** which in turn is rockably mounted in a pair of arms **68** secured to the wicket shaft **50**, these arms swinging with the wicket rods. Mounted on one end of the gripper blade shaft **66** is a pulley **70** over which is trained a belt **72** which is also trained on another pulley **74** fixedly secured on a sleeve **76** rotatably mounted on the wicket shaft **50**. Secured to the sleeve **76** is a radial arm **78** to the outer end of which is pivotally connected a piston **80** of another air cylinder **82**. Interconnecting the sleeve **76** and the pulley **74** is a coil spring **82** biasing the pulley in direction for moving the gripper blade element into gripping position i.e., against a laundry piece on the wicket. This direction is counterclockwise as viewed in FIGS. **2** and **4**, — the spring tends to rotate the pulley **74** in the direction noted, and acting through the belt **72** tends to move the gripper blade in corresponding direction with the extended edge of the gripper blade element engaging the wicket, or a folded piece on the wicket, and upon contraction of the air cylinder **81** the pulley **74** is rotated in clockwise direction, which acting through the belt **72**, opens the gripper blade to a position represented in FIG. **5***a*.

A control switch **84** is positioned with a trip finger **86** projecting beyond the surface of the conveyor belt **36** and beyond the wicket when the latter is in retracted position, for engagement by the folded piece as it slides down over the wicket, this setting into motion the steps in the operation of the wicket and the clamp blade as represented in FIG. **6** and as referred to hereinbelow.

In the operation of the wicket and the clamp blade a cycle may be considered as beginning at FIG. **5***a*, in which the cylinder **58** is released and the spring **52** holds the wicket in retracted position, and further in which the cylinder **81** is contracted and holds the gripper blade in open position. Upon the folded piece engaging the switch **84**, the cylinder **81** is released and the spring **82** (FIG. **4**) moves the gripper blade into gripping position as represented in FIG. **5***b*. Then the cylinder **58** is energized or contracted and it swings the wicket down into advanced position as represented in FIG. **5***c*. The gripper blade moves bodily with the wicket as the latter is swung down but it remains in gripping position i.e., against the piece on the wicket, this under the constant action of the spring **82**.

As the folded piece is placed directly on the conveyor **40**, or in a stack on other pieces, the gripper blade while still in gripping position is positioned close to the horizontal, or extending in the direction of the piece just placed.

As the next step in the operation, the cylinder **81** is energized or contracted, tending to swing the gripper blade toward non-gripping position, and in the position of FIG. **5***c* it would tend to swing it clockwise. Closely timed with this step, the cylinder **58** is released and the spring **52** swings the wicket back to retracted position. As the wicket swings upwardly, it carries the gripper blade with it, and in the initial portion of this upward movement of the wicket, the gripper blade is moved relatively in the opposite direction, or clockwise, and the movement resulting from this compound movement is that the extended edge of the blade element follows a path receding from between the stacked pieces that closely approximates a straight horizontal movement, pulling out from between the stacked pieces and leaving the pieces in a perfect stack. When the wicket has moved to retracted position, the gripper blade remains in open position and a cycle has been completed, and a new one initiated upon the next folded piece sliding down over the wicket.

Suitable timing means may include a switch **88** actuated by a cam **90** on the wicket shaft **50**, as the wicket is moved down to the conveyor **40** in the stacking operation, for controlling the timing steps set out in FIG. **6**.

It will be appreciated that the timing as between the first increment of movement of the wicket downward from its retracted position, may vary somewhat with complete effectiveness because the wicket at this point would be moving slowly and the folded piece would not tend to be thrown off until it has moved an appreciable extent and is moving rapidly.

We claim:

1. A laundry folder for folding small pieces comprising,

means for receiving the pieces at an entrance end,

conveyor means for conveying the pieces through the folder to an exit end,

means for folding the pieces in their passage through the folder,

a wicket adjacent the exit end of the folder, the wicket being mounted for swinging movement on a transverse axis adjacent its lower edge, the wicket being movable about its axis between a retracted generally upright position in which it is adapted to receive folded pieces thereon from the conveyor means, and an advanced lower position in which it is adjacent the horizontal,

a supporting member at the exit end for receiving the folded pieces from the wicket,

a gripper blade adjacent the lower edge of the wicket and operative for engaging only the lower edge of the folded piece on the wicket and gripping it against the wicket,

means for so grippingly engaging the gripper blade against the folded piece, and for moving the gripper blade downwardly with the wicket throughout the advancing movement of the wicket until the folded piece is placed on the supporting member, and

means for withdrawing the gripper blade from engagement with a folded piece on generally horizontal supporting member in generally horizontal direction longitudinally of the engaged surface of the folded piece, substantially without disturbing the folded piece on the supporting member.

2. A laundry folder according to claim 1 including yieldable means biasing the wicket to retracted position, and power means for moving it to advanced position.

3. A laundry folder according to claim 1 and including yielding means biasing the gripper blade into gripping position, and power means for moving the gripper blade to open non-gripping position.

4. A laundry folder according to claim 1 and including means operative for moving the gripper blade out of gripping position, when the wicket is in advanced position, in such direction that the gripper blade is disposed close to the plane of the underside of the piece so placed.

5. A laundry folder according to claim 4 and including means operative in the initial portion of the movement of the wicket from its advanced position for moving the gripper blade away from the wicket in that portion of the movement of the latter, thereby producing a compound movement of the gripper blade which results in said movement thereof in said plane.

6. A laundry folder according to claim 1 wherein the wicket includes a transverse shaft at its lower end and a plurality of rods secured thereto, the shaft being rockably mounted for swinging the rods between its retracted position and advanced position, said gripper blade including a transverse shaft and a blade element secured thereto, means mounting the gripper blade on the wicket shaft at a position displaced radially from the axis of the wicket shaft, and positioning the gripper blade shaft at a short distance from the side of the wicket, said gripper blade shaft being rockably mounted for movement of the extended end of the blade element into and out of engagement with the wicket, and means for so moving the blade element between its opposite position.

7. A laundry folder according to claim 6 and including means operable about the axis of the wicket shaft for moving the gripper blade between its positions, and belt means drivingly interconnecting said last means and gripper blade shaft.

8. A laundry folder according to claim 7 in which the means for rocking the gripper blade shaft includes a sleeve on the wicket shaft and a radial arm on the sleeve, and the construction further includes pulleys on the two shafts on which said belt is trained.

9. A laundry folder according to claim 8 and including power means secured to said arm for swinging the arm and thus rocking the sleeve and moving the gripper blade, and the construction further includes yielding means biasing said sleeve in direction for moving the gripper blade into gripping position.

10. In a laundry folder, a wicket construction and means for operating it comprising a wicket including a shaft and a plurality of rods secured thereto and extending transaxially therefrom, the shaft being rockable between an upper retracted position of the wicket and a downward advanced position of the wicket, and the wicket when in retracted position being adapted for placement of folded laundry piece thereover, a pulley mounted on said wicket shaft and a flexible element trained on said pulley, a tension spring connected with said flexible element and biasing the wicket to its upper retracted position, a power means secured to the other end of said flexible element and operative for moving the wicket to downward advanced position, a gripper blade including a shaft and a blade element secured thereto, radial arms secured to the wicket shaft and means rockably mounting the gripper blade shaft in the extended ends of said arms and at a position closely proximate the wicket rods, a sleeve on said wicket shaft, a pulley on said sleeve and a pulley on the gripper blade shaft, and belt means drivingly interconnecting the last two pulleys, yielding means interconnecting the wicket shaft and said sleeve and thereby biasing the gripper blade in direction engaging the extended edge of the gripper blade element against the wicket, a radial arm secured to said sleeve, a second power device connected with the extended end of the last radial arm and operative for moving the sleeve, and therethrough the gripper blade, in non-gripping direction away from the wicket rods.

* * * * *