

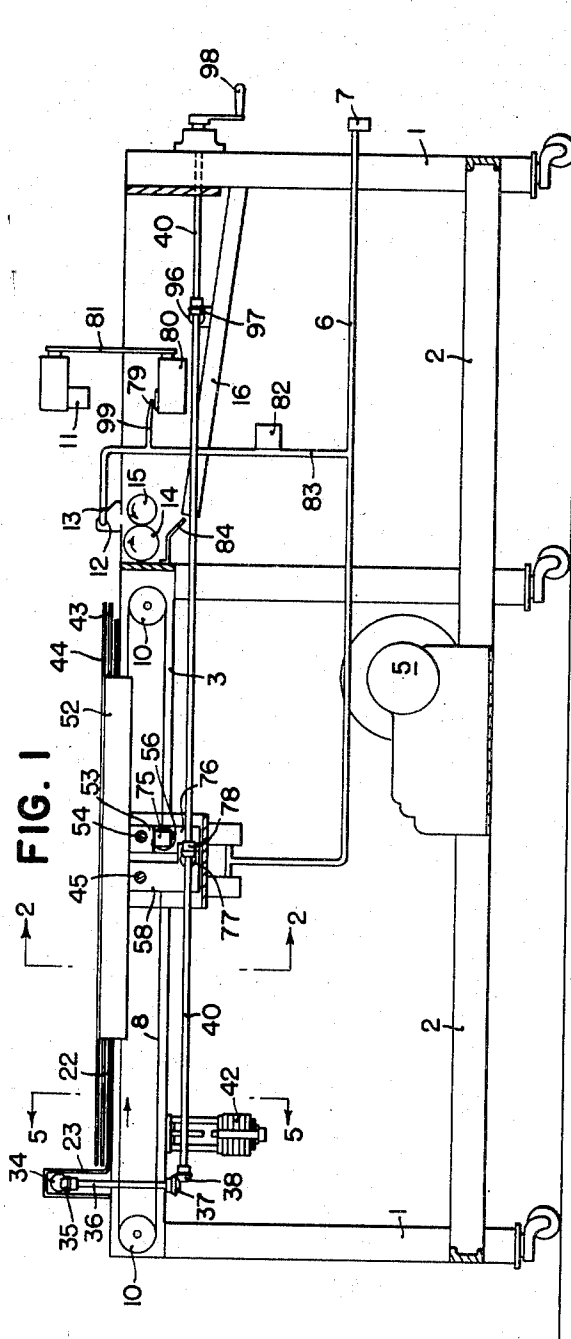
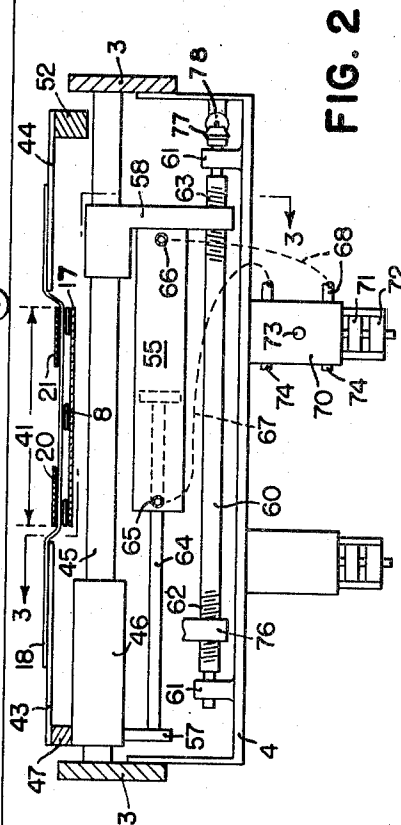
May 24, 1955

J. E. GILCHRIST
SMALL PIECE FOLDERS

2,709,080

Filed July 9, 1951

2 Sheets-Sheet 1



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2,709,080

SMALL PIECE FOLDERS

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Application July 9, 1951, Serial No. 235,794

5 Claims. (Cl. 270—84)

The invention relates to a device into which a towel or the like may be fed and which will fold the towel and deliver successive towels thus folded to a stack.

More particularly the invention relates to an improvement in that type of towel folding machine in which the towel is laid out flat and folded longitudinally along two parallel lines by turning inward the portions outside of these lines to fold the towel into three layers. Subsequently the towel is cross folded so that the folded towel has six layers. When fed into the machine all towels, even if they vary slightly in size, are folded so that, when the finished folded towels are stacked, they will all have the same width and only the lengths of the folded towels will vary.

The invention is an improvement on the type of folder illustrated in the patent granted to Robert L. Sjostrom on March 20, 1951, bearing No. 2,545,798.

In machines of this type the sides of the towel are folded inward over a metal plate and the width of this metal plate determines the width of the folded towel. Since it is desired to fold the towel into roughly three even sections, it is obvious that for a given plate only towels of certain widths can be folded satisfactorily. Thus, if the machine is set for hand towels, and bath towels are to be folded, parts of the machine have to be dismantled, a wider plate substituted, and the stroke of the shuttle plates which push the sides of the towel over the center plate adjusted.

In folders of the type illustrated in the Sjostrom patent referred to the towel is carried into position so that its central section lies below a center plate while the sides of the towel are supported on shuttle plates which are at a slightly higher elevation than the central plate. When the tapes which carry the towel into place have brought the towel to the proper position, the towel is held against further movement such as by a pad which holds the towel against the center plate and then timed mechanism brings the shuttle plates in, one plate coming in first to fold over one side of the towel, and the other plate coming in next to fold over the other side of the towel. After both shuttle plates have made their movement and returned to their original positions the towel is released and carried on to the place where it is cross folded and then the towel passes down a chute to the stacking device. In the patent referred to the shuttle plates are moved by shafts and cranks carried by the shafts.

In the pending application filed by Sjostrom on September 2, 1950, and bearing Ser. No. 183,063 air operated shuttle plates are substituted for the mechanically moved shuttle plates in the patent referred to. As more fully explained in the pending application, the arrival of the towel in the position for folding closes circuits which cause the towel to be held in position against further longitudinal movement and closes the circuits which open a solenoid controlled air valve that moves one shuttle plate forward. This shuttle plate, as it moves forward, engages certain switches which cause the other

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shuttle plate in turn to move forward while the shuttle plate which moved initially returns to its position. When the second shuttle plate has completed its movement it will also have engaged micro switches which control one solenoid operated valve which will have caused the cylinder to withdraw the shuttle plate and another valve to release the towel to allow it to move on to the cross folding position as described in the Sjostrom patent referred to.

10 When the towel reaches the cross folding position, the forward edge passes under a photocell which actuates the means for cross folding.

It has been found that folders of this type were limited in practice because they do not permit folding towels into varied widths. This is of special importance if bath towels are to be folded. A further limitation of the existing machine is that, when running bath towels, lint accumulates on the photocell so that the cross folding is unreliable.

20 As the present invention is an improvement on the pending Sjostrom application referred to and retains the air operated shuttle plates and the electrical circuits which control them, these features need not be described in the present application.

25 Hitherto, if the width of fold was to be changed, a center plate of a different width had to be inserted and the center plate which had been previously used had to be removed.

30 The travel of the shuttle plates had to be adjusted to the width of the new plate.

The sides of the chute which guides the towel from the folding machine to the stacker or a table had to be adjusted to the new width of towel.

35 The present application is directed to means whereby folders of this type can be readily adjusted to fold towels of different widths. To do this three adjustments have to be made.

40 In the present invention the center plate of the fixed width in the previous patent and pending applications is replaced by a plate in two sections; each shuttle plate and its actuating cylinder and the micro switch which it controls are so mounted that they may be moved in unison; and the chute is made in two sections which can be moved relative to each other.

45 Also provision is made for blowing the lint from the photocell, every time a cross fold is made.

A mechanism actuated manually with one crank is provided which will move the sections of the center plate, the shuttle plates and their driving units, and the sections of the chute proportionately.

50 It is now, for the first time, possible for the operator to complete running towels of one size and then to turn a crank and be prepared immediately to run towels of another size.

55 One object of the invention is to provide a folder adaptable for use on towels of various widths which has an adjustable center plate.

60 Another object of the invention is to provide a folder having shuttle plates which, together with their driving cylinders, can readily be adjusted for use with towels of different widths.

65 Another object of the invention is to provide a folder having a single adjustment which will automatically adjust the width of the center plate and the travel of the shuttle plates.

70 Another object of the invention is to provide a folder with a single manual control by which the operator can automatically adjust the width of the center plate, the travel of the shuttle plates, and the width of the guiding chute, when another width of towel is to be run.

Another object of the invention is to provide a folding machine in which some of the folding operations are

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controlled by a photocell placed below the towel to be folded and which responds to an electric light whose beams are cut off by a passing towel thereby releasing an air jet which automatically blows away lint which may have accumulated on the photocell as the towels pass through the machine.

Another object of the invention is to support the shuttle plate in such a manner that it may be moved in a horizontal plane by a cylinder engaging it near its center without binding.

Fig. 1 is a vertical section of a folder embodying the invention.

Fig. 2 is a vertical cross section along line 2—2 in Fig. 1 with some parts removed, drawn to an enlarged scale.

Fig. 3 is a longitudinal vertical section along the line 3—3 of Fig. 2.

Fig. 4 is a top view of the rear portion of the machine shown in Fig. 1 with some portions omitted. This is also drawn to an enlarged scale.

Fig. 5 is a vertical section along line 5—5 in Fig. 1 also drawn to an enlarged scale, showing the means for supporting the sections of the central plate and omitting some portions.

Fig. 6 is a vertical section taken along line 6—6 in Fig. 4.

Fig. 7 is a top plan view of the shuttle plate.

In these drawings, and more especially Fig. 1, the posts of the folder frame are indicated at 1. These posts are tied together near the floor level by the horizontal bars 2. Longitudinal beams 3 tie some of the posts together near the top forming a frame generally similar to that of a table.

A depressed plate 4, supported between beams 3, carries mechanism to be described. The frame supports a motor 5, which, through its attached speed reducer drives the folder. The frame also carries an air line 6 which is connected to a source of air under pressure at 7.

The pieces to be folded are received at the left on parallel belts 8 that are passed around rollers 10 which are supported in the frame.

These belts are moved continuously in the direction of the arrow in Fig. 1 by the motor 5 through a drive, not shown.

After the piece is folded in the manner described below, its forward end passes under a light 11 and this causes air to be discharged from openings 12 in pipe 13 in a manner to be described.

This causes a cross fold by pushing the piece already folded longitudinally between rollers 14 and 15 turning in opposite directions.

The cross folded piece is delivered through the inclined chute generally indicated at 16 to the right hand end of the folder in Fig. 1.

A metal plate 17 is supported near the center of this frame as shown in Fig. 5 and serves as a table for horizontal belts 8. These endless belts 8, sliding over the table, carry the piece 18, which we will refer to by way of illustration as a towel, forward into position for folding on the table. As the towel is carried by these belts onto the table 17 it passes under the two sections 20, 21 of a center plate 22. These center plate sections 20, 21 as shown in Fig. 2, extend over the full length of the maximum sized towel to be folded on the machine and are supported only at the left hand end as shown in Fig. 1. They are attached to the vertical plates 23, 24 as shown in Fig. 5. The vertical plate 23 carries two sleeves 25 and 26. The plate 24 carries two similar sleeves 27 and 28. The sleeves 25 and 27 have a cylindrical bore which permits them to slide on a horizontal shaft 30. The sleeve 25 has a right hand thread and the sleeve 28 has a left hand thread meshing with corresponding right and left hand threads at 31 and 32 on the shaft 30. This shaft 30 is rotatably supported in two posts 33 and

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carries on its end a bevel gear 34. This gear meshes with a bevel gear 35 on the vertical shaft 36, also supported in a post 33. At its lower end the shaft 36 carries another bevel gear 37 which meshes with a bevel gear 38 carried by a shaft 40. It is obvious that by turning the shaft 40 the two plates 23, 24 will be moved toward or away from each other and that in this way the two sections 20, 21 of the center plate 22 are correspondingly moved. In this manner the width 41, Fig. 2, of the center section to which the towel is to be folded may be selected.

As explained in the patent referred to, when the piece to be folded reaches the proper position on plate 17 for the folding to take place, a solenoid 42 is energized and this prevents the piece from moving further forward to the right in Fig. 1 even though the belts 8 continue to run.

The towel is folded by two shuttle plates 43 and 44 whose support and method of operation will next be described.

These shuttle plates which must move rapidly, are supported only on their one edge as shown in Fig. 2 and must remain in a horizontal plane. Each plate is moved only by the single cylinder near its center yet its ends must not tip. This is accomplished by the construction shown in Figs. 3 and 7.

A stationary rod 45 extends from one side of the frame to the other and is fixed therein. A rectangular block 46 slides on this rod. This block is made long and a girder 47 is attached to one face of the block. In this way the shuttle plate is held in a plane parallel to the rod 45 above it. This prevents its ends from tilting. This girder carries rollers 48 free to turn on studs 50. These rollers roll on cross bars 51 which are also supported by the frame beams 3. Thus a simple, non-binding support is provided for the shuttle plate.

The girder 47 supports the shuttle plate 43 as shown in Fig. 2. In a similar manner another girder 52 supports the plate 44. Plate 44 is in a plane slightly higher than that of the plate 43. These shuttle plates 43 and 44 have a horizontal reciprocating motion which enables each to pass over the top of the sections of the center plate 22.

As the two girders 47, 52 move, they will always remain parallel since the block 46 and a similar block 53 attached to 52 extend for some length along the rod 45 and the rod 54 respectively.

As the belts 8 carry the towel 18 along under the sections 20, 21 of the center plate 22, the edges of the towel are suitably guided to slide along onto the top of shuttle plates 43, and 44 as shown in Fig. 2.

Thus it will appear that if the plates 43 and 44 successively move horizontally inward after the towel is in place, the towel will be folded into three sections and the center section will be of the width determined by the spacing of the two sections 20, 21 of the center plate.

In order to reciprocate the plates, one plate is provided with an air cylinder 55 and the other is provided with an air cylinder 56. In order to provide for the lateral adjustment of the plates the position in the frame of each air cylinder can be varied.

For greater clarity only the air cylinder which reciprocates plate 43 is shown in Fig. 2. The adjustment of the plate 44 is accomplished by duplicate equipment supported on the stationary rod 54 which is at the same level as rod 45 and parallel thereto. Describing first the mechanism for the operation of the plate as it shuttles back and forth, the block 46 already referred to and which moves the plate 43, has a downward extension 57. Slidably carried on rod 45 is an L-shaped frame 58 which extends down to receive a rod 60 which is threaded at this point. The rod 60 is supported below the rod 45 and parallel thereto. This rod is rotatably supported in posts 61 attached to plate 4 and carries left and right hand threaded sections 62 and 63. It will be seen that

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by turning the rod 60 the frame 58 will be moved along the rod.

The frame 58 carries the air cylinder 55. This cylinder carries a piston and the piston rod 64 of this piston is connected to the downward extension 57 of the block 46. Air is supplied either to the end 65 or to end 66 of the cylinder through lines 67 and 68 respectively. The ports to lines 67 and 68 are spaced some distance from the end of the cylinder so that, as the piston moves toward either end of the cylinder, air will be trapped at the exhaust side to provide a cushion which prevents a metallic impact. The lines 67, 68 are flexible and they are connected to a three-way valve 70 which is selectively actuated by either of two solenoids 71 and 72. One of these solenoids will connect the source of air pressure 73 with line 67, and thus will move the piston rod 64 to the right and cause the shuttle plate 43 to move to the right. At the proper time the pressure line 73 will be connected to line 68 and line 67 will be connected to an exhaust 74, thus returning the piston to the left and returning shuttle plate 43 to the left.

The shuttle plate 44 is moved in the same manner by means of the mechanism including a shaft 54, block 53, extension 75, frame 76 and cylinder 58 all similar to the respective parts 45, 46, 57, 58, 55, which move plate 43.

When no towel is passing through the machine the pressure line 73 will be connected to line 68 holding the plate 43 at the left end of its range of travel in Fig. 2.

If the distance between the two sections 20 and 21 of the center plate 22 is changed it is necessary to change the position of the cylinders which actuate the plates 43 and 44 so that they will make the fold correctly. To do this it is merely necessary to turn the rod 60. The rod 60 carries at one end a bevel gear 77 which meshes with a bevel gear 78 carried on the shaft 40. Thus it will be seen that turning shaft 40 will move not only the sections 20, 21 of the center plate but also the two air cylinders which move plates 43 and 44. It will be noted that shaft 60 moves both plates since it passes through both L-shaped frames 58 and 76.

After the sides of the towel have been folded in by the shuttle plates 43, 44 the solenoid 42 releases the towel and the belts 8 carry the towel forward so that its forward end passes between the light 11 and an electric eye 80. These two items are mounted on a frame 81 whose position is adjustable on the main frame of the machine, but whose adjustment is not shown.

As the light beam is interrupted, current is supplied to a solenoid actuated air valve 82 which lets air under pressure to pass through line 83 to the cross pipe 13 which has openings at 12 on its under side. This air pushes the towel downward so that the two rollers 14, 15 will drag the towel into the space between them and deliver it to the chute 16 over the deflecting plate 84.

One of the features of the invention is that the difficulty hitherto experienced by lint accumulating on the photocell 80 and stopping the operation of the machine, is eliminated by delivery of a puff of air through a jet 79 every time a towel is folded.

The chute 16 is made in two sections 85, 86. The sides of the chute sections 85 and 86 are turned up as shown at 87, 88 and the distance 90 between the side plates 87, 88 should be slightly greater than the width of the finished folded towel so that the towels may be correctly guided into a stacking device. Each of these two sections is supported by a hanger 91 which is attached to a sleeve 92 that slides on a cross rod 93 supported in the frame. This cross rod may be threaded left and right on its two ends as shown at 94 and nuts 95 engaged by these threads are connected by the hangers 91 to the sliding sleeves 92. On shaft 93 is carried a bevel gear 96 which meshes with another gear 97. This bevel gear 97 is supported on the long shaft 40. A

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handle 98 at the end of shaft 40 thus permits turning the shaft and thus simultaneously adjusting the spacing of the two sections 20, 21 of the center plate, the position of plates 43 and 44 and the distance between side plates 87, 88.

In the operation of this machine, the operator sets the machine by turning the handle 98 so that the center plate sections are spaced a distance suitable for the particular towel to be folded. This operation will automatically adjust the position of the shuttle plates and their driving members and the sides of the chute so that as the towels are fed into the machine they will be passed onto the table, be stopped, folded by the shuttle plates and passed on, all as described in the pending application Sjostrom 183,063. As the towel whose sides have been folded in now passes under the light 11, it will interrupt the light beam acting on photo cell 80 and this will actuate the solenoid operated air valve 82 in an air line 83 which is a branch of line 6. This supplies air to the pipe 13 and to the pipe 99 which blows the lint from the photo cell 80.

The cross folded towel is now delivered through the chute whose width has been adjusted to suit that lot of towels.

What I claim is:

1. In a folder for towels or the like, in combination, a table, two co-planar plates, means associated with said table for supporting said co-planar plates above said table by one of their ends, means for carrying a piece to be folded between the table and said co-planar plates, shuttle plates located above said co-planar plates and to either side thereof onto which the outer portions of said piece to be folded are carried when the piece is moved into place with its central portion located between said co-planar plates and said table, power operated means for moving said shuttle plates in a predetermined range over said co-planar plates in succession to thereby fold the piece into three layers, and an adjustment device associated with said co-planar plates and said power operated means to simultaneously move said co-planar plates relative to each other and to adjust the range of operation of said shuttle plates.

2. In a folder for towels or the like, in combination, a table, two co-planar plates, means associated with said table for supporting said co-planar plates above said table by one of their ends, means for carrying a piece to be folded between the table and said co-planar plates, shuttle plates located above said co-planar plates and to either side thereof onto which the outer portions of said piece to be folded are carried when the piece is moved into place with its central portion located between said co-planar plates and said table, power operated means for moving said shuttle plates in a predetermined manner in a preselected range over said co-planar plates to thereby fold the piece, and an adjustment device associated with said co-planar plates and said power operated means to simultaneously move said co-planar plates relative to each other and to adjust the range of operation of said shuttle plates.

3. In a folder for towels or the like, in combination, a table, two co-planar plates, means associated with said table for supporting said co-planar plates above said table at one of their ends while the other ends rest upon said table, means for carrying a piece to be folded between the table and said co-planar plates past said supporting means, shuttle plates located above said co-planar plates and to either side thereof onto which the outer portions of said piece to be folded are carried when the piece is moved into place with its central portion located between said co-planar plates and said table, power operated means for moving said shuttle plates in a predetermined manner over said co-planar plates to thereby fold the piece, and an adjustment device associated with said co-planar plates and said power operated means to simultaneously move said co-planar plates rela-

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tive to each other and to adjust the manner of operation of said shuttle plates.

4. In a folder for towels or the like, in combination, a table, two co-planar plates, means associated with said table for supporting said co-planar plates above said table, first adjustment means for moving said co-planar plates relative to each other equally in opposite directions, means for carrying a piece to be folded between the table and said co-planar plates past said supporting means, shuttle plates located above said co-planar plates and to either side thereof onto which the outer portions of said piece to be folded are carried when the piece is moved into place with its central portion located between said co-planar plates and the table, power operated means for moving said shuttle plates a predetermined distance over said co-planar plates in a direction parallel to the table in succession thereby folding the piece into three layers, and second adjustment means connected to said first adjustment means and associated with said power operated means for changing the distance of movement of said shuttle plates.

5. In a folder for towels or the like, in combination, a table, two co-planar plates, means associated with said table for supporting said co-planar plates above said table, first adjustment means for moving said co-planar

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plates relative to each other in opposite directions, means for carrying a piece to be folded between the table and said co-planar plates, shuttle plates located above said co-planar plates and to either side thereof and parallel therewith onto which the outer portions of said piece to be folded are carried when the piece is moved into place with its central portion located between said co-planar plates and the table, power operated means for moving said shuttle plates over said co-planar plates in succession thereby folding the piece into three layers, and second adjustment means associated with said first adjustment means and said power operated means for changing operation of said shuttle plates.

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