June 22, 1965 R. L. SJOSTROM 3,190,640

FOLDING MACHINE

Original Filed May 24, 1963 3 Sheets-Sheet 1

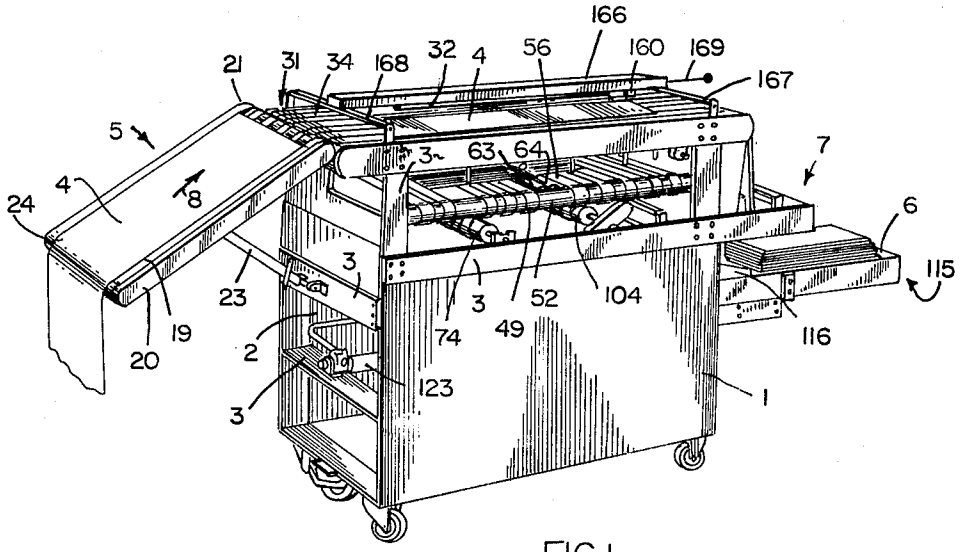


FIG.1

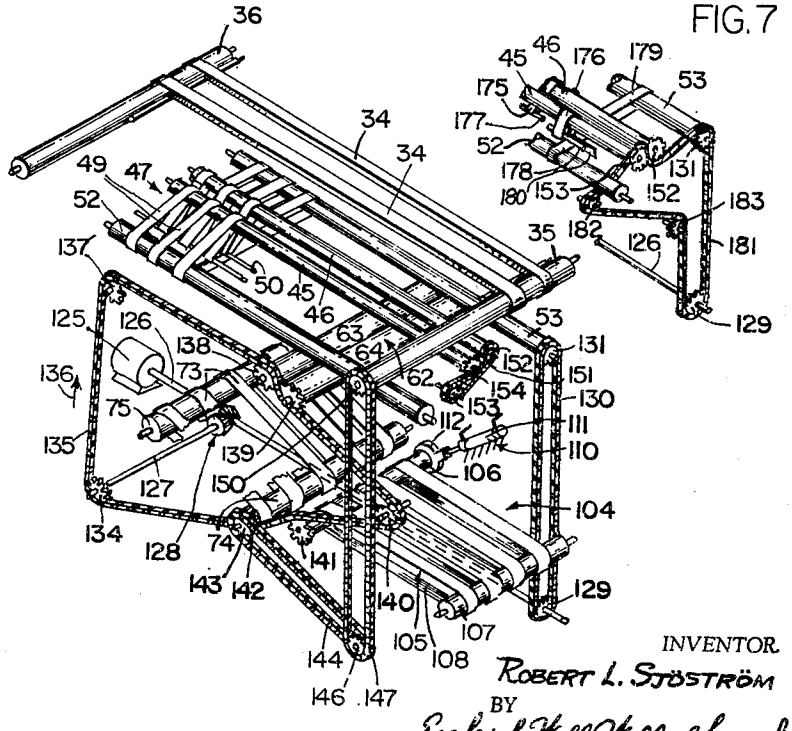


FIG.2

FIG.7

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FIG. 3

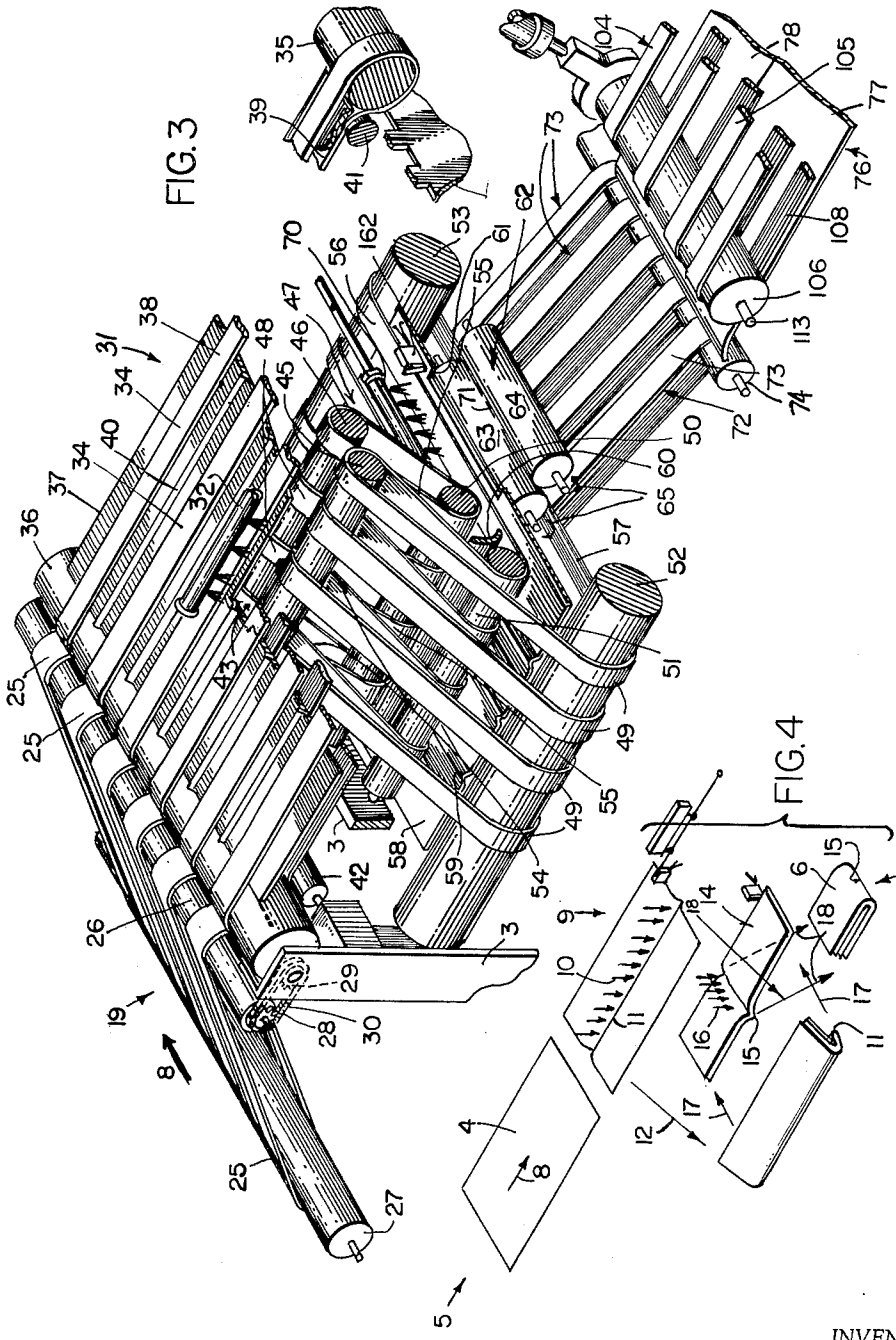


FIG. 4

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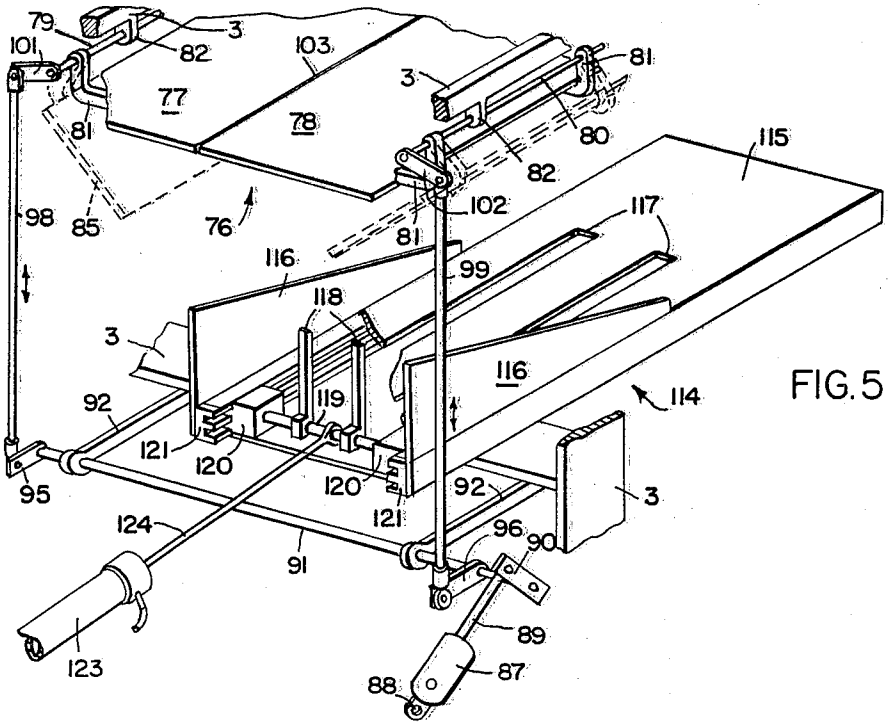


FIG. 5

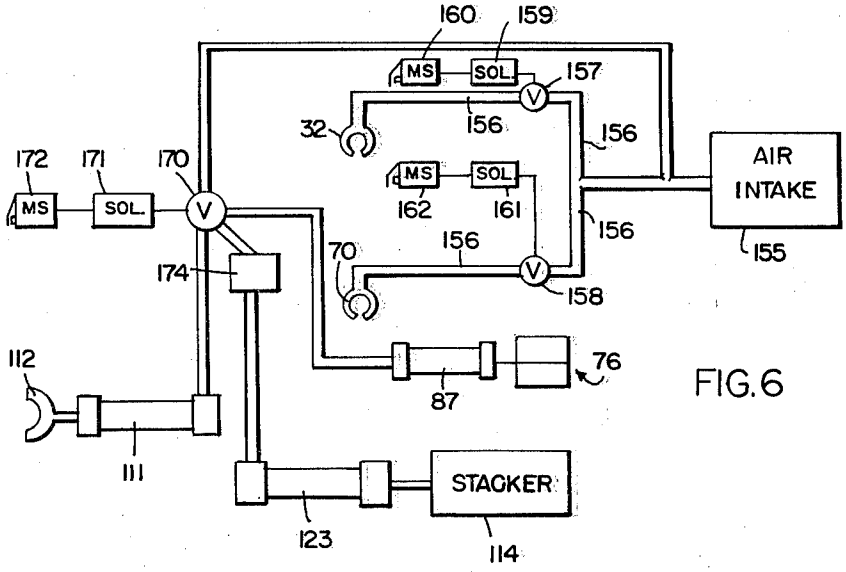


FIG. 6

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3,190,640

FOLDING MACHINE

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Continuation of application Ser. No. 283,096, May 24, 1963. This application June 1, 1964, Ser. No. 374,873
18 Claims. (Cl. 270—66)

This is a continuation of application Serial No. 283,096 filed May 24, 1963 by applicant for an invention entitled Folding Machine, now abandoned.

The present invention relates to a machine for folding successively delivered sheets.

In several industries, particularly the linen supply and laundry industries, there is a need for an improved machine that will accurately and efficiently fold sheets supplied to it in quick succession. In the linen supply industry for example, it is customary to separately launder similarly sized articles such as napkins and towels. These articles are then fed successively by an operator to an ironer. After they are delivered from the ironer it is necessary to fold them and stack them for subsequent handling. While some attempts have been made to provide a machine that will receive and fold towels delivered from an ironer, such machines have been relatively expensive, subject to frequent and expensive maintenance and repair and incapable of accurately folding articles as napkins and towels. In addition these machines are often incapable of receiving and folding articles at the rate at which they are delivered from the ironer machine.

It is an object of the present invention to provide a machine for folding flexible articles and preferably textile articles such as napkins and towels efficiently and accurately. It is also an object of the present invention to provide a relatively inexpensive, but efficient and rugged machine for folding flexible articles, which requires little maintenance or attendance during operation. A further object of this invention is to provide a folding machine particularly useful in connection with laundry and linen supply operations, which is adapted to fold and uniformly stack flat flexible articles successively delivered to it. One further object of this invention is to provide a machine which is adapted to quarter fold rectangular articles such as napkins and towels, and thereafter form successive stacks of preselected numbers.

This invention is primarily a mechanical device that has a minimum number of electrical components and may be made without the use of vacuum or photo tubes, transistors or complex electronic circuitry.

In this invention there is provided means for folding flexible sheets or articles such as towels or napkins. A pair of conveyor means, preferably rolls carrying endless belts are arranged with each conveyor means lying in horizontal planes and extending angularly to each other. These conveyor means are adapted to move the sheets successively in two directions, one normal to the other. A folding means preferably comprising a pair of parallel nip rolls is positioned with the axis of the rolls longitudinally with respect to the direction of movement of the first conveyor means. This first folding means is adapted to engage and fold an article carried on the first conveyor means preferably along a line longitudinal with respect to the direction of movement of the article. A second folding means is positioned directly beneath the second conveyor means and is adapted to receive the once folded article as it is carried on the second conveyor means and effect a second fold along a line angular to the first fold in the article. Means are also provided for stacking successively folded articles into accurate and even stacks of preselected numbers.

These and other objects and advantages of the present invention will be more clearly understood when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a preferred embodiment of the invention;

FIG. 2 is a fragmentary perspective view illustrating certain rollers and the drive mechanism therefor;

FIG. 3 is a fragmentary perspective view illustrating portions of the various conveyor means;

FIG. 4 is a perspective schematic view illustrating the method and sequence of folding;

FIG. 5 is a fragmentary perspective view of portions of the delivery mechanism;

FIG. 6 is a schematic illustration of a portion of the actuating mechanism, and

FIG. 7 is a perspective fragmentary view of a modification of the invention.

The embodiment of the invention illustrated is designed primarily for quarter folding textile articles such as towels and napkins and is particularly useful in the linen supply industry for receiving ironed articles delivered from commercial ironers. The principles of this invention may however be embodied in machines useful for other purposes and in other industries, wherever it is desirable to fold successively flexible sheet materials.

Referring to FIG. 1 there is provided a machine having a frame which includes side panels 1 and 2, and various vertically, transversely and longitudinally extending frames or beams 3 suitably secured together and located to support various elements hereinafter described. Articles 4 are successively placed by an operator in flat form as illustrated in FIG. 1 at the receiving or rear end 5 of the machine and after successive foldings preferably into quarter folded form are delivered in stacks 6 at the delivery or forward end 7 of the machine.

The construction of the machine will be best understood from a preliminary consideration of the folding sequence effected on articles 4 passing through it. The folding sequence is illustrated in FIG. 4. An article 4 fed into the rear end 5 moves forwardly in the direction of arrow 8. At a preselected position 9 the article is forced downwardly in the direction of arrows 10 along a line 11 longitudinal of the direction of forward movement illustrated by arrow 8. This effects a first fold in the article 4. The article is then carried laterally and downwardly of the machine in the direction of arrow 12 with the line or folded edge 11 foremost. The once folded article 4 is then redirected in a horizontal plane and in a direction opposite the direction of first lateral movement. At a second preselected point 14, a second fold along line or edge 15 is effected by forcing the article 4 downwardly in the direction of arrows 16 along the line 15 which is longitudinal of the direction of movement of the article indicated by the arrow 17. The article is then carried downwardly and forwardly in a direction indicated by arrows 18 with the line or edge 15 foremost to a delivery point where the now twice folded sheet is delivered to a stack at a preselected point at the delivery or forward end 7.

Referring now to FIG. 1, there is shown a conveyor means 19 at the rear end 5. The conveyor means 19 is supported on the frame 20 which in turn is pivotable about its forward end 21 which is suitably secured to beams 3. This frame 20 may be adjustably secured at different angular positions by suitable means which may comprise a conventional lockable telescopic support 23, suitably pivotably secured at one end to a beam 3, and at the other end to the lower portion of the frame 20 (not shown). The conveyor means 19 may be adjustable so that the rear end 24 can be adjustably aligned with the delivery end of an ironer or some other suitable mechanism. The conveyor means (FIG. 3) comprises a plurality of

endless webs or belts 25 supported for rotation with their upper surfaces adapted to move in the forward direction of arrow 8. These webs 25 are mounted on rolls 26 and 27 in turn respectively journaled in the frame 21. The shaft on which roll 26 is mounted carries a sprocket 28 which is operatively coupled to a sprocket 29 by chain 30 so that actuation of sprocket 29 in a clockwise direction as viewed in FIG. 3 will cause movement of the webs 25 in the direction indicated by arrow 8.

A conveyor means 31 is positioned in the upper portion of the machine and is adapted to successively receive articles 4 from the conveyor means 19 and carry the articles successively in the forward direction of arrow 8 (FIG. 4). The conveyor means 31 is best illustrated in FIGS. 2 and 3 and includes a plurality of parallel horizontally disposed endless webs or belts 34, arranged longitudinally of the machine and supported by forward and rear rolls 35 and 36 respectively. Rolls 35 and 36 are in turn suitably supported for rotation in journals fixed to beams 3. A support plate 37 is positioned intermediate the upper and lower portions 38 and 39 of the belts 34. This plate 37 is provided with a plurality of longitudinally extending ridges 40 which project between and above the upper portions of webs 34. The plate 37 provides support means for the upper portions 38 of the belts 34 and the ridges 40 provide rail-like supports for articles 4 with minimum frictional retarding as they are carried forward by the belts 34. The lower portion 39 of the belts 34 are positioned below the support plate 37 and pass over idler rolls 41 and 42 with the idler rolls suitably journaled and supported on beams 3.

A longitudinally extending rectangular opening 43 is formed preferably at the center of plate 37 with the opening extending between a pair of adjacent belts 34 and directly over rolls 45 and 46 of a first folding means 47.

Positioned directly below the opening 43 and extending longitudinally of the belts 34 are first folding rolls 45 and 46. These rolls are suitably jonrnaled on beams 3 extending transverse thereto. These rolls are adjacent and parallel one another thereby defining a line of substantial tangency which is preferably symmetrically located with respect to the opening 43 and intermediate adjacent belts. These rolls 45 and 46 form a portion of a first folding means 47. In this arrangement, there are also two sets of endless belts. One set is formed of parallel belts 48 and the other set is formed of parallel belts 49. Belts 48 are supported on and extend about first folding roller 46 and a roll 50 which is suitably supported in journals in turn fixed to the beams 3 below and laterally displaced from rolls 46. Associated with the other set of belts 49 are parallel rolls 51, 52 and 53, each of which is suitably supported for rotation in journals in turn fixed to beams 3 which form a part of the frame. Rolls 52 and 53 are positioned on opposite sides of the machine adjacent the side panels (see FIGS. 1 and 2). Idler roll 51 is positioned parallel to rolls 52 and 53, with its axis above the plane through which the axes of rolls 52 and 53 pass but below the axis of roll 50. Belts 49 encircle rolls 45, 52 and 53. One portion 54 of the belts 49 extend from roll 45 angularly downwardly and bear against idler roll 51 with portion 54 having a facing section diverging from the adjacent portion 55 of belt 48 as illustrated. Portion 55 of belt 48 comprises the upper portion of the belt between rolls 46 and 50 with this portion 55 also inclined angularly downwardly. A second portion 56 of belts 49 extends horizontally and transversely from one side of the machine to the other with this portion 56 extending under roll 51 and over roll 53. Positioned below portion 56 of roll 49 and above the lower portion 57 of the belts 49 is a second support plate 58. This second support plate 58 supports portions 56 of the belts 49 and is provided with a plurality of ridges 59 which extend transversely to the length of the machine between portions 56 of belts 49 and project upwardly above the upper surface of these belts 56 in a manner similar to ridges 40 in respect to belts 34. An arcuate guide plate 60 extends longitudinally of and between rolls

50 and 51 with the concave portion of the arcuate plate 60 facing roll 50 and adapted to engage articles being delivered from the belts 48 at roll 50 and redirect them onto portion 56 of belt 49 for movement in the direction of arrow 17. The plate 60 may if desired have vertically extending fingers projecting upwardly between portions 54 of belts 49 to assure engagement with articles 4 moving between portions 54 and 55. Also forming a part of the first folding means 47 is the air tube 32 which extends longitudinally of the belt 34 and is positioned directly above the longitudinally extending opening 43. A plurality of perforations in the tube 32 are directed downward in alignment with the line of tangency of rolls 45 and 46, and are so arranged that articles 4 positioned between the air tubes 32 and opening 43 will, on passage of air into the air tube 32, be blown downwardly between rolls 45 and 46 along the longitudinally extending line or edge 11 of the article.

The second support plate 58 is provided with a rectangular opening 61 extending parallel to and intermediate portions 56 of adjacent belts 49. A second folding means 62 is positioned directly below this opening 61 for effecting a second fold in the once folded articles carried on portions 56 of belt 49.

The second folding means 62 includes a pair of parallel rolls 63 and 64 which are positioned with their axes parallel to the direction of movement of portions 56 of belts 49 and transverse of the machine. The rolls 63 and 64 are journaled and suitably supported on beams 3 for rotation toward one another in directions indicated by arrows 65. These rolls are positioned directly below the opening 61 with the rolls substantially tangent to one another and with the line of substantial tangency 71 preferably symmetrical with opening 61. An air tube 70 having a line of perforations is positioned above the opening 61 with the line of perforations directed downward and in alignment with the line of tangency 71 of rolls 63 and 64.

Positioned below rolls 63 and 64 is a lower conveyor means 72. This lower conveyor means comprises a plurality of endless belts or webs 73 which are carried and driven by parallel rolls 74 and 75 (see FIG. 2). The rolls 74 and 75 are suitably journaled for rotation on their axis in the frame 3 with the rolls 74 and 75 parallel to rolls 63 and 64 whereby belts 73 are normal to the axes of rolls 63 and 64. Roll 74 is positioned with its axis in a plane lower than the axis of roll 75. Roll 75 is positioned rearwardly of roll 63 and roll 74 is positioned forwardly of roll 64. Articles delivered with the second fold effected between rolls 63 and 64 drop onto the downwardly and forwardly moving upper surface of belts 73.

Articles moving from the forward end of belts 73 are delivered onto the rear edge of platform 76 illustrated in FIGS. 3 and 5. Platform 76 is formed of two sections 77 and 78 respectively secured to shafts 79 and 80 by a series of brackets 81. The shafts in turn are journaled longitudinally of the machine in journals 82 in turn secured to the beams 3. The platform sections 77 and 78 are supported for pivoting rotation between the normal position illustrated in FIG. 5 and the open or dotted position illustrated at 85. The platforms are operatively controlled for this pivoting movement by a hydraulic air cylinder 87 which is supported on the frame at one end by a pin 88 which permits the cylinder to rotate over a limited arc. The shaft 89 of the air cylinder projects from the other end and is pivotally connected to a lever 90 which in turn is secured at its other end to the shaft 91. The shaft 91 extends transversely of the machine and is suitably supported in journals formed in mounts 92. The shaft 91 is adapted to be rotated in either direction on actuation of the air cylinder 87. This shaft has secured to it a pair of levers 95 and 96, which in turn are connected by the links 98 and 99 to levers 101 and 102 respectively. Levers 101 and 102 are in turn connected to the shafts 79 and 80. Rotation of the shaft 91 causes levers 95 and 96 to rotate correspondingly. These levers 95 and 96 in turn cause pivoting of levers 101 and

102 through the links 98 and 99 and thereby control the opening and closing of the sections 77 and 78 of the platform 76 along the center line 103.

Articles 4 delivered from the end of the belts 73 of the lower conveyor means onto the rear edge of the platform 76 are engaged and carried forwardly by the conveyor means 104 (FIG. 2 and FIG. 3). This conveyor means includes a plurality of longitudinally extending parallel belts or webs 105 which encircle the parallel rolls 106 and 107. The lower section 108 of the belts 105 lies parallel to and adjacent the platform 76 when it is in its normal closed position. Therefore articles passing onto the platform 76 are carried forwardly by frictional engagement of the sections 108 of the belts 105 to a preselected position at which point the conveyor means 104 is momentarily stopped and the platform opened on line 103 from the position shown in solid to the position shown in dotted outline, thereby permitting the twice folded article to fall downwardly into the stacking mechanism 114 (FIG. 5). The conveyor means is momentarily stopped by a brake and clutch mechanism 110 (FIG. 2). In this brake mechanism, an air cylinder 111 is suitably supported on a beam 3 and is connected to a friction clutch 112 adapted to engage and stop rotation of roll 106 about its shaft 113 momentarily. It has been found useful to momentarily stop the conveyor means 104 just prior to or as the platform 76 opens to assure a uniform stacking of articles on the stacker below.

The stacker or stacking mechanism 114 is best illustrated in FIG. 5. This stacker 114 includes a longitudinally extending chute 115 preferably having side walls 116. The stacker is positioned with its rear end directly below the platform 76 and is adapted to receive articles falling downwardly when the sections 77 and 78 of the stacker are opened so that the articles will fall directly one on top of another until a pile of a selected number is accumulated. When a preselected number of articles have been stacked in a pile, the pile is moved forwardly toward the end of the chute 115 where the pile may be removed by an operator. In this arrangement the chute 115 is provided with a pair of elongated openings 117 which extend from the rear end of the chute 115. A pair of fingers 118 extend upwardly through these openings. These fingers 118 are carried on a transverse shaft 119 in turn supported at either end by sliding carriages 120. The carriages are adapted to be moved forwardly and rearwardly in channels 121 which extend longitudinally of the chute 115 at either side. The shaft 124 of the hydraulic cylinder 123 is connected to the shaft 119 so that movement of the shaft 124 on actuation of the cylinder 123 will cause forward and rearward movement of the fingers 118 at selected intervals. The hydraulic cylinder 123 is in turn suitably supported on the frame 3.

The drive mechanism for the various components and rollers is best illustrated in FIG. 2. In this arrangement a motor 125 suitably mounted on the frame rotates shaft 126 in a clockwise direction as viewed in FIG. 2. A shaft 127 normal to shaft 126 is operatively engaged with shaft 126 for rotation therewith through the bevel gears 128. An extension of the shaft 126 has a sprocket 129 mounted on it. This sprocket 129 drives chain 130 which in turn is connected to a sprocket 131 mounted on shaft 53.

Shaft 127, suitably supported for rotation on the frame, has a sprocket 134 mounted on it. Rotation of the shaft 127 and the sprocket 134 drives the endless chain 135 in a clockwise direction illustrated by the arrow 136. The chain 135 encircles sprockets 137, 138, 134, 140 and 142 and engages sprockets 139 and 141. Sprockets 137 and 140 are idler sprockets suitably supported on the frame. Sprockets 138 and 139 are mounted respectively on rolls 63 and 64 and the chain 135 passes between these sprockets engaging sprocket 138 on the inside of the chain and sprocket 139 on the outside of the chain. Sprocket 141 is secured to roll 106 while sprocket 142 is secured to roll 74. The chain 135 passes between these sprockets 141 and 142 engaging sprocket 141 on the outside of the chain and sprocket 142 on the inside of the chain. Rotation of the chain in the direction of arrow 136 thereby causes rolls 63 and 64 to move in the direction of arrow 65 (FIG. 3), belts 73 to move in a clockwise (FIG. 2) direction with the lower section 108 moving forwardly. Also connected to the shaft supporting sprocket 142 is a second sprocket 143 which engages the chain 144. This chain 144 in turn engages a double sprocket 146 suitably secured to the frame. Sprocket 146 engages chain 147 which extends upwardly and encircles sprocket 150 mounted on roll 35. This chain arrangement causes the roll 35 to rotate in a clockwise direction as viewed in FIG. 2, thereby moving the upper portion 38 of the belts 34 forwardly. Rotation of roll 53 through chain 130 causes corresponding rotation of rolls 52 and 45 because of their interengagement with belts 49. Rolls 46 and 50 are rotated by chain 151 which interengages and encircles sprockets 152 and 153 mounted respectively on rolls 46 and 50. The outer side of the chain 151 engages sprocket 154 which is mounted on rolls 45 thereby causing belts 58 to move in a direction opposite to belts 49.

A schematic arrangement of a suitable means for actuating the various elements described is illustrated in FIG. 6. In this arrangement, air to the air tube 32 and air tube 70 is supplied from air intake source 155 through pipes 156 with valves 157 and 158 controlling respectively the emission of the air blasts through tubes 32 and 70. Valve 157 is actuated to permit an air blast through the tube 32 by means of a solenoid 159 in turn electrically controlled and actuated by a microswitch 160. Valve 158 is operatively controlled by solenoid 161 in turn actuated by microswitch 162. Microswitch 160 is supported on longitudinal extending beam 166 in turn supported at its ends on cross braces 167 and 168 (FIG. 1). Microswitch 160 has its actuating finger extending downwardly and adapted to successively engage the leading edge of articles 4 as they are carried forwardly on the belts 34. The specific location of the microswitch 160 may be longitudinally adjusted by sliding it lengthwise on the beam 166 using handle 169 which is connected to the microswitch. Microswitch 162 is suitably positioned above opening 61 (FIG. 3) with its actuating finger projecting downwardly and adapted to engage once folded articles passing over opening 61. Upon actuation microswitch 162 is adapted to open valve 158 to cause air to pass through the tube 70 blowing an article on the belts 49 downwardly between rollers 63 and 64.

A valve 170 also controls air from the air intake source 155 and actuates cylinders 111, 123 and 87 which in turn respectively actuate brake 112, stacker 114, and platform 76. Valve 170 is controlled by solenoid 171 in turn actuated by the microswitch 172. Microswitch 172 is positioned intermediate belts 105 of the conveyor means 104 at the forward end and is adapted to be actuated by a forwardly moving article 4 as it is passed between belts 105 and platform 76. Actuation of microswitch 172 causes the opening of valve 170 in a selective sequence. Valve 170 is adapted to first actuate air cylinder 111 which causes brake 112 to stop the rotation of roll 106 momentarily. At the same time or shortly thereafter, valve 170 actuates air cylinder 87. When air cylinder 87 is actuated, the leverage system described in connection with FIG. 5 causes the platform 78 to open thereby permitting the article carried forwardly between the platform 78 and the belts 105 to drop downwardly onto the chute 115. When a preselected number of articles have piled up in a uniform stack on chute 115 just forward of fingers 118, a suitable mechanism causes valve 170 or a secondary valve system to actuate air cylinder 173 which in turn causes fingers 118 to move forward and towards the forward end of the chute 115. Any suitable control mechanism and valve system may be used to periodically or cylically

actuate air cylinder 123 and may for example, include a stepping relay and secondary solenoid adapted to actuate a valve which permits cyclical passage of air through valve 170 and into air cylinder 123. Such a general arrangement is illustrated schematically at 174.

While the foregoing describes the specific embodiment of this invention other variations are contemplated. For example, FIG. 7 illustrated a modification of certain elements of the preferred embodiment of this invention. In the drawing of FIG. 7 like numbers refer to like elements heretofore described and those portions not described are similar to the preferred embodiment.

In this modification the rolls 45 and 46 of the first folding means are encircled respectively by groups of endless belts 175 and 176. The group of belts 175 also encircles roll 177 suitably supported for rotation in the frame and lying with its axis parallel to roll 45. Group of belts 176 encircles roll 178 which is supported in the frame for rotation with its axis below roll 46 and adjacent roll 177. Rolls 177 and 178 are positioned just above group of endless belts 179 which encircle and are rotated by rolls 52 and 53. An arcuate guide 180 lies between rolls 177 and 178 and is adapted to engage articles which are folded between rolls 45 and 46 and which are carried downwardly between them by the facing portions of the belts 175 and 176, with the articles so carried being directed by the arcuate guide 180 onto the upper surface of belts 179.

The drive mechanism for the modification as shown in FIG. 7 includes an endless chain 181 which encircles sprockets 131, 152, 182 and 129. Sprocket 182 is an idler sprocket. Sprocket 129 is mounted on shaft 126 which is rotated in a counterclockwise direction as viewed in FIG. 7 by the motor. Sprocket 131 is secured to roll 53. Sprocket 152 is secured to roll 46. The outer side of the chain engages idler sprocket 183 and sprocket 153 which is secured to roll 45. The chain passes between sprockets 152 and 153 to cause rotation of the rolls 45 and 46 in the direction indicated by arrows 48.

Having now described my invention, I claim:

1. A machine for multiple folding a flexible sheet comprising,

a first conveyor means comprising a plurality of spaced endless parallel belts supported on rolls at the forward and rear ends of said machine and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate adjacent edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second rolls spaced apart and with both of said second pair positioned below and lateral with respect to said first pair of rolls,

a third pair of rolls supported for rotation on axes parallel to the axes of said second pair of rolls with said third pair of rolls spaced apart farther than said second pair of rolls and with both of said third pair below said second pair,

a first plurality of endless parallel belts encircling one of said first pair and both of said third pair of rolls and bearing against the outer part of one of said second pair of rolls thereby providing one portion of said belts lying normal and in a plane parallel to and below said portion of the belts of said first conveyor means and a second portion extending angularly downwardly from said one of said first pair of rolls,

a second plurality of endless parallel belts encircling the other of said first pair and the other of said second pair of rolls and providing a portion thereof in facing relation with said second portion of said first plurality of belts and extending angularly downward whereby sheets folded by said first folding means will be carried angularly downwardly between said facing portions,

means at the lower part of said facing portions intermediate said second pair of rolls for engaging and redirecting sheets carried angularly downwardly onto said one portion of said first plurality of belts for movement in a direction transverse to said longitudinal forward direction,

and means for effecting a second fold in said sheets after each has been carried onto said one portion of said first plurality of belts.

2. A machine as set forth in claim 1 having a support plate positioned parallel to and below said portion of said first conveyor means belts and having an aperture formed therein intermediate a pair of said first conveyor means belts and over said first folding means, with said plate supporting said portion of said conveyor means belts.

3. A machine as set forth in claim 2 wherein each of said first conveyor means belts has a second portion opposite said first mentioned portions and on the other side of said plate, and retaining means beneath said second portion of said first conveyor means belts for retaining said second portion close to the lower surface of said plate.

4. A machine as set forth in claim 3 wherein said retaining means comprises a pair of rolls with each parallel to and adjacent a different one of said first conveyor means rolls and engaging and retaining the lower surface of said second portion in a plane higher than the common plane tangential to the lowermost portions of both of said first conveyor means rolls.

5. A machine as set forth in claim 2 having a second support plate positioned parallel to and below said one portion of said first plurality of endless belts, said second support plate having an aperture formed therein intermediate a pair of said belts and over said means for effecting a second fold.

6. A machine as set forth in claim 5 wherein said first mentioned and said second support plates are provided with longitudinally extending ridges intermediate and projecting above said portion of said belts with which said plates are associated.

7. A machine as set forth in claim 1 wherein said means at the lower portion of said facing portions comprises an arcuate plate extending longitudinally of said second pair of rolls with the concave surface of said plate facing said other of said second pair of rolls.

8. A machine for multiple folding a flexible sheet comprising,

a first conveyor means comprising a plurality of spaced endless parallel belts supported on rolls at the forward and rear ends of said machine and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate adjacent edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second rolls spaced apart and with both of said second pair positioned below and lateral with respect to said first pair of rolls,

a third pair of rolls supported for rotation on axes parallel to the axes of said second pair of rolls with said third pair of rolls spaced apart farther than said second pair of rolls and with both of said third pair below said second pair,

endless belt means having belts encircling said first pair of parallel rolls and at least one of said second pair of rolls and providing portions of said belts facing

each other and extending angularly downwardly whereby sheets folded by said first folding means will be carried angularly downwardly between said facing portions,

additional belt means encircling said third pair of rolls and providing a portion of said belt means lying normal and in a plane parallel to and below said first conveyor means belts and movable in a direction normal thereto,

means intermediate said second pair of rolls at the lower part of said facing portion for engaging and redirecting sheets carried angularly downwardly onto said portion of said additional belt means for movement in a direction transverse to said longitudinal forward direction and a second folding means for effecting a second fold transverse to said first fold in said sheet after it has been carried onto said additional belt means.

9. A machine as set forth in claim 8 including a lower conveyor means having portions positioned below said second folding means to receive sheets therefrom, with said belts of said lower conveyor means normal to said belts of said additional belt means.

10. A machine as set forth in claim 9 for receiving and stacking successively delivered sheets including,

a horizontally arranged platform having one end thereof adjacent to said lower conveyor means to receive sheets delivered therefrom,

a delivery conveyor means having a plurality of endless belts carried on rolls with a downwardly facing portion of said belts in facing relation with said platform to carry sheets on said platform forwardly, and

means for opening said platform when said sheets reach a selected position whereby said sheets will successively drop downwardly.

11. A machine as set forth in claim 10, wherein:

said platform is formed of a pair of adjacent parallelly hinged sections adapted to be pivoted to and from a normally closed horizontal position, and means for stopping movement of said delivery conveyor means and opening said platform when a sheet is carried by said delivery conveyor means to a selected position on said platform.

12. A machine for multiple folding a flexible sheet comprising:

a first conveyor means having a plurality of endless parallel belts supported on rolls and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second rolls spaced farther apart than and below said first pair of rolls,

a second plurality of endless parallel belts encircling one of said first and one of said second pair of rolls and having a portion thereof lying in a plane extending angularly downwardly from said first folding means,

a third plurality of endless parallel belts encircling the other rolls of said first and second pairs of rolls and having a portion thereof facing said portion of said second plurality of endless belts with the lower parts of said facing portions diverging from each other, and

means extending between said diverging parts of said belts for engaging and redirecting sheets passing therebetween.

13. A machine as set forth in claim 12 wherein said second plurality of endless belts has a second portion below and angular to said first mentioned portion.

14. A machine for multiple folding a flexible sheet comprising:

a first conveyor means having a plurality of endless parallel belts supported on rolls and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second rolls spaced farther apart and below said first pair of rolls,

a second plurality of endless parallel belts encircling one of said first and one of said second pair of rolls and having a portion thereof lying in a plane extending angularly downwardly from said first folding means,

a third plurality of endless parallel belts encircling the other of said first and second pairs of rolls and having a first portion thereof facing said portion of said second plurality of endless belts and a second portion continuous with and below said first portion diverging and spaced from said second plurality of belts whereby flexible folded sheets will be engaged on one side only by belts when at said second portion.

15. A machine as set forth in claim 14 having means adjacent said first and second portions of said third plurality of belts for engaging and redirecting moving sheets carried between said portion of said second plurality of belts and said first portion of said third plurality of belts.

16. A machine for multiple folding a flexible sheet comprising:

a first conveyor means comprising a plurality of spaced endless parallel belts supported on rolls at the forward and rear ends of said machine and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate adjacent edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second rolls spaced apart and with both of said second pair positioned below and lateral with respect to said first pair of rolls,

a third pair of rolls supported for rotation on axes parallel to the axes of said second pair of rolls with said third pair of rolls spaced apart farther than said second pair of rolls and with both of said third pair below said second pair,

endless belt means having belts encircling said first pair of parallel rolls and at least one of said second pair of rolls and providing portions of said belts facing each other and extending angularly downwardly whereby sheets folded by said first folding means will be carried angularly downwardly between said facing portions,

additional belt means encircling said third pair of rolls and providing a portion of said belt means lying normal and in a plane parallel to and below said first conveyor means belts and movable in a direction normal thereto, and

means intermediate said second pair of rolls adjacent the lower part of said facing portion for engaging and redirecting sheets carried angularly downwardly in a direction transverse to said longitudinal forward direction.

17. A machine for multiple folding a flexible sheet comprising:

a first conveyor means comprising a plurality of spaced

endless parallel belts supported on rolls at the forward and rear ends of said machine and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate adjacent edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel to the axes of said first pair of rolls with said second pair of rolls positioned below and lateral with respect to said first pair of rolls,

a third pair of rolls supported for rotation on axes parallel to the axes of said second pair of rolls with said third pair of rolls spaced apart farther than said second pair of rolls and with both of said third pair below said second pair,

endless belt means having belts encircling said first pair of parallel rolls and at least one of said second pair of rolls and providing portions of said belts facing each other and extending angularly downwardly whereby sheets folded by said first folding means will be carried angularly downwardly between said facing portions,

additional belt means encircling said third pair of rolls and providing a portion of said belt means lying normal and in a plane parallel to and below said first conveyor means belts and movable in a direction normal thereto,

means intermediate said second pair of rolls at the lower part of said facing portion for engaging and redirecting sheets carried angularly downwardly onto said portion of said additional belt means for movement in a direction transverse to said longitudinal forward direction and a second folding means for

effecting a second fold transverse to said first fold in said sheet after it has been carried onto said additional belt means.

18. A machine for multiple folding a flexible sheet comprising:

a first conveyor means comprising a plurality of spaced endless parallel belts supported on rolls at the forward and rear ends of said machine and providing a portion on which sheets may be moved in a longitudinal forward direction,

a first folding means including a first pair of parallel adjacent rolls supported for opposite rotation on axes parallel to said longitudinal direction with said first pair of rolls positioned below and intermediate adjacent edges of two of said belts,

a second pair of rolls supported for rotation on axes parallel and laterally below the axes of said first pair of rolls, and

a pair of endless belt means with each encircling one of each of said pairs of rolls and having angularly downwardly extending portions separated from each other and extending in diverging planes, with said planes defining an area between said portions through which areas said sheet is adapted to pass.

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