March 17, 1942. C. J. MALHIOT 2,276,584

FOLDING MACHINE

Filed Aug. 3, 1940 4 Sheets-Sheet 1

Fig. 1

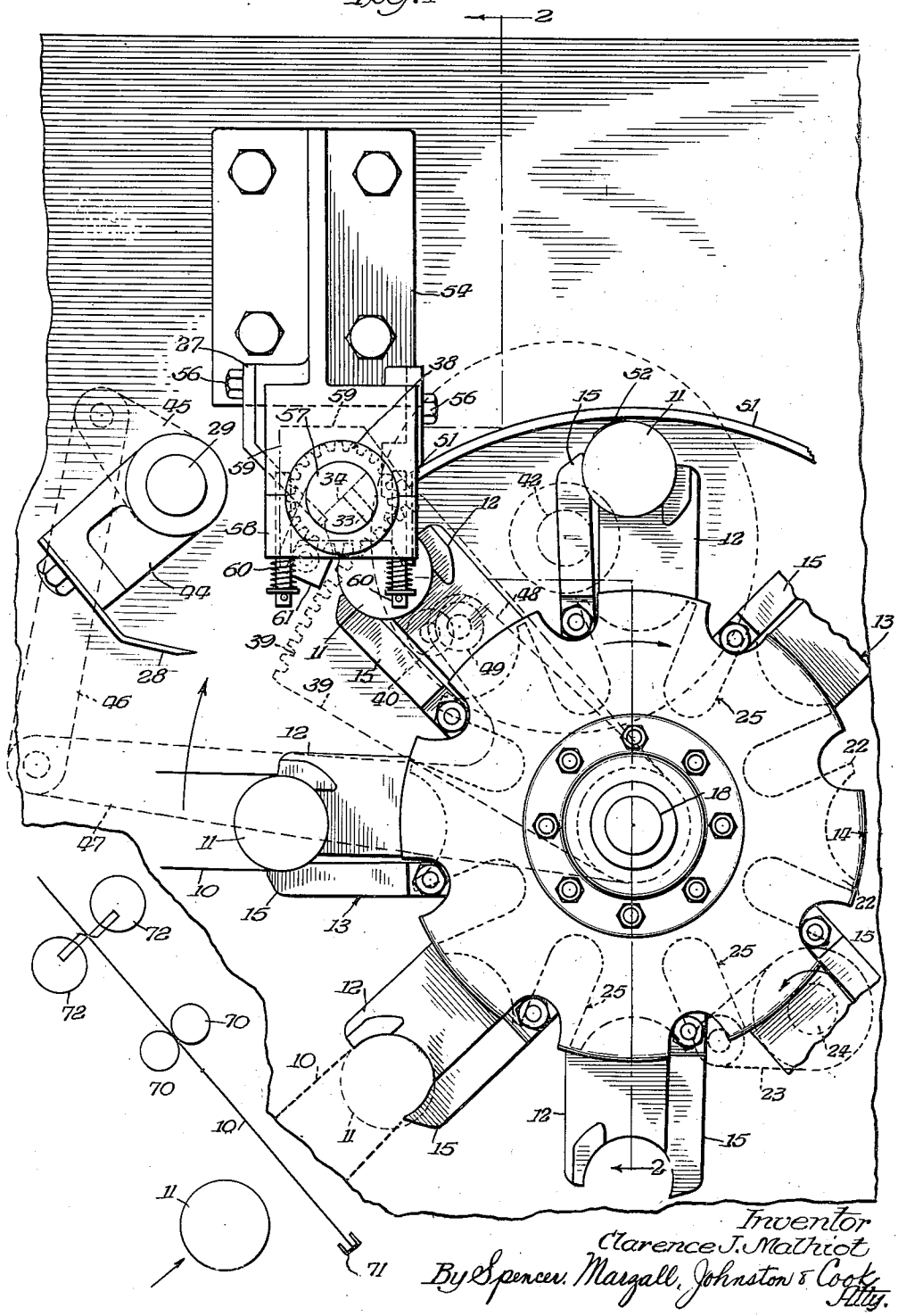

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FIG. 2

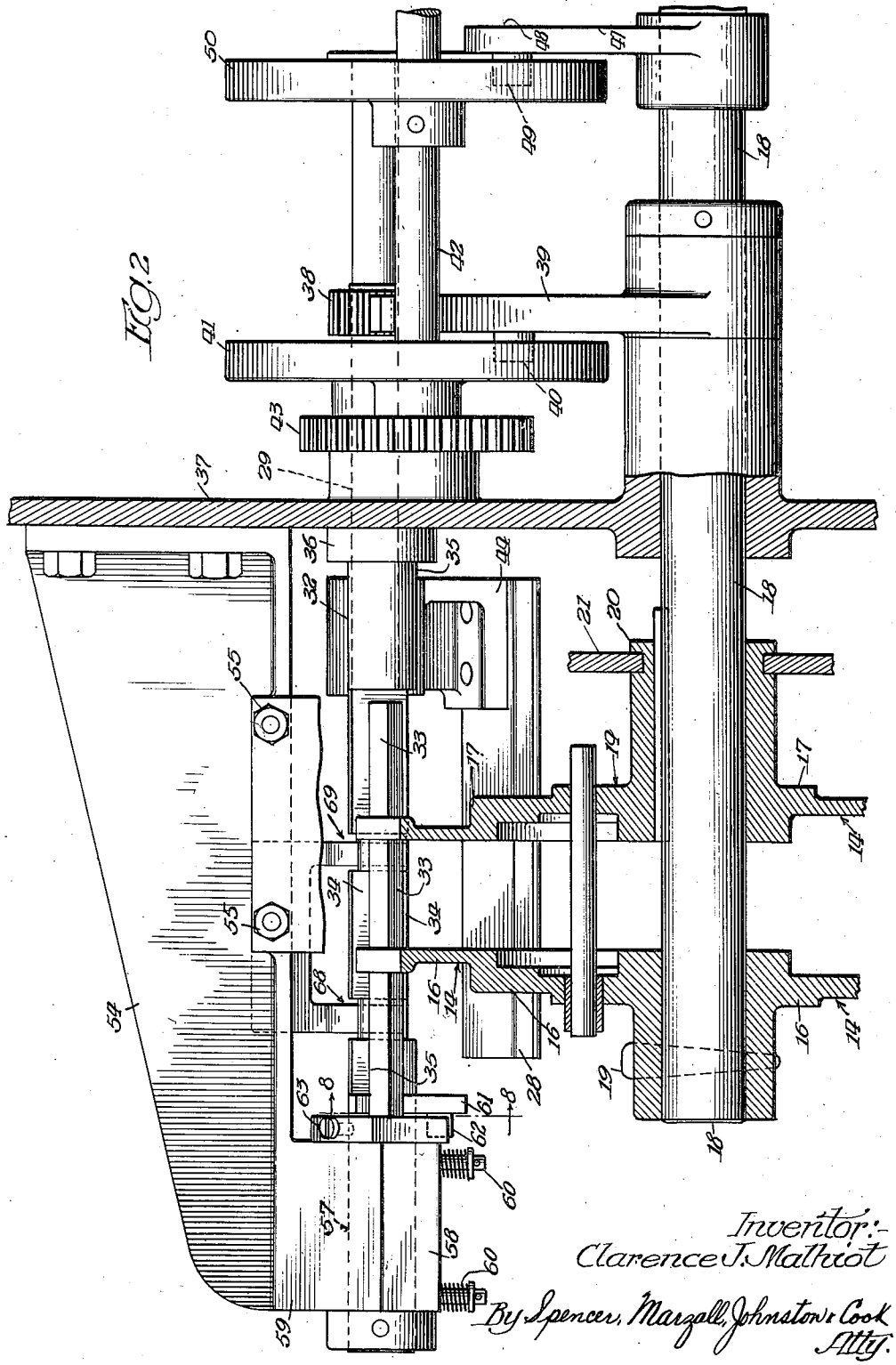

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Fig. 3

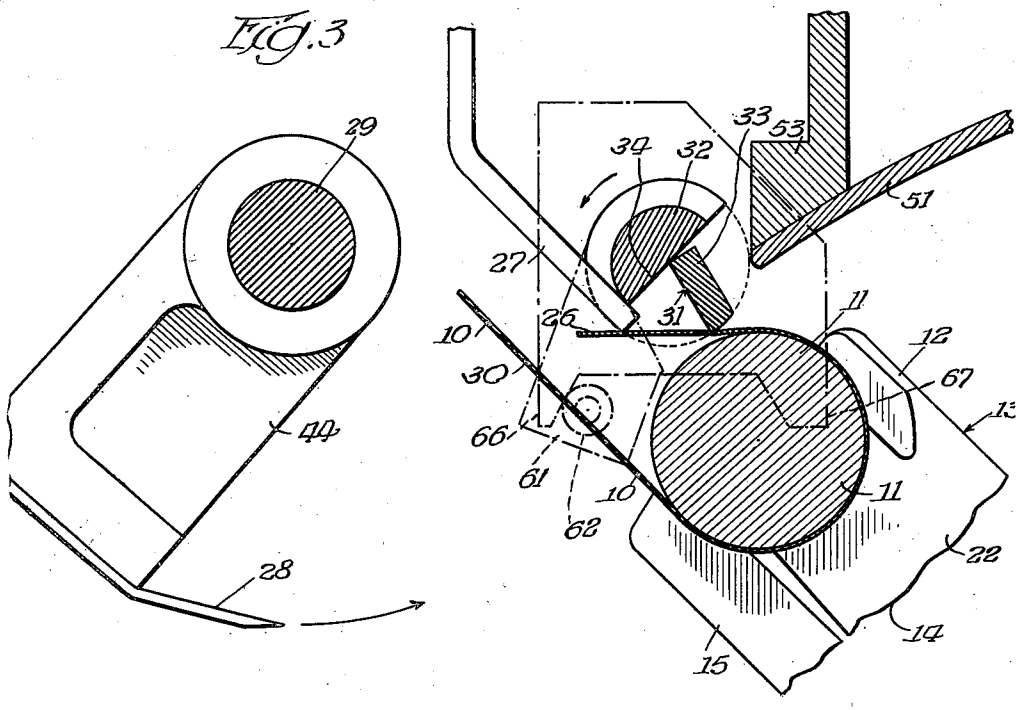

Fig. 4

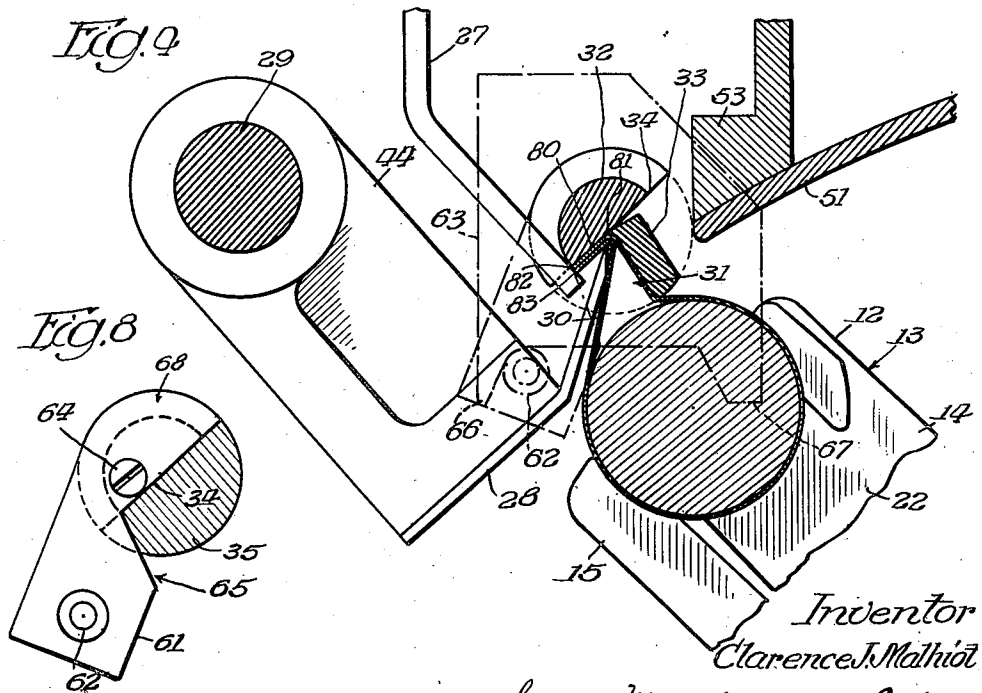

Fig. 8

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Fig. 5

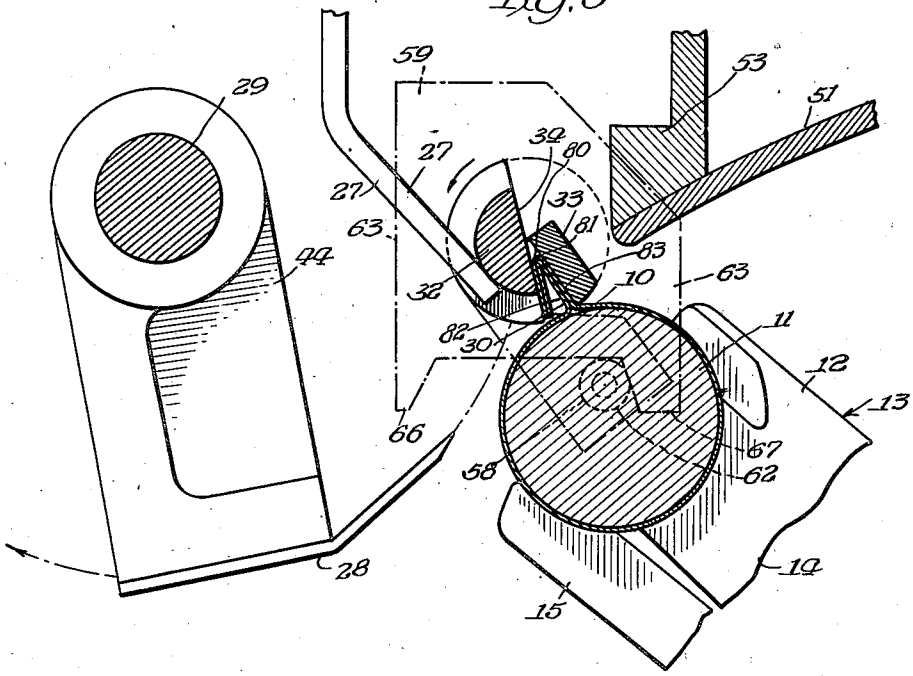

Fig. 6

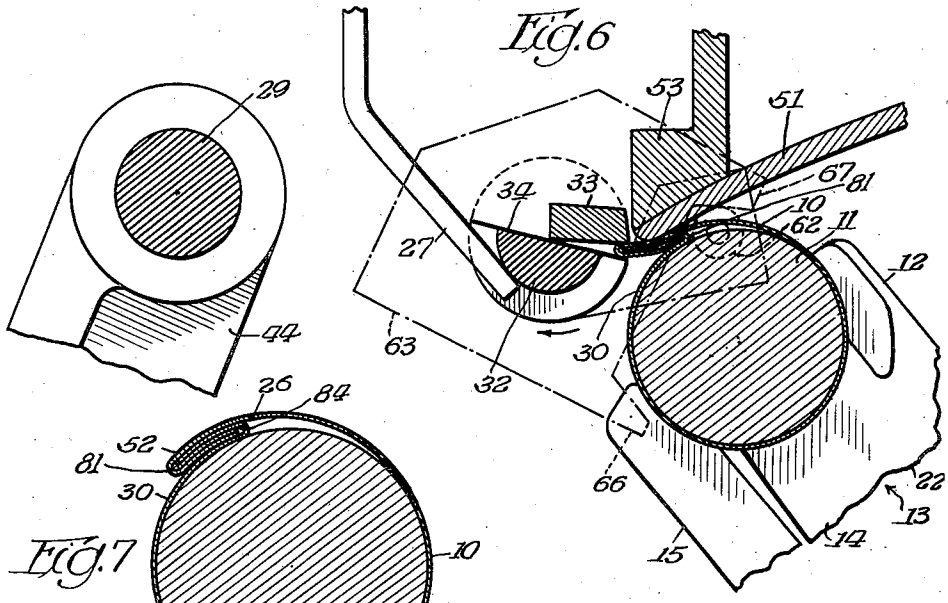

Fig. 7

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UNITED STATES PATENT OFFICE

2,276,584

FOLDING MACHINE

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Application August 3, 1940, Serial No. 350,203

12 Claims. (Cl. 93—2)

This invention relates to folding machines in general, and particularly to folding machines for folding a wrapper in a predetermined manner about an article.

The primary object of the present invention is to provide new and novel means for quickly and economically providing a so-called "druggist fold" longitudinally of the package.

Another important object of the invention is to provide a fold of the so-called "druggist" type longitudinally of the package automatically by successive operations.

Another object of the invention is to provide a folding machine which is provided with means for forcing the article through a pre-arranged wrapper and mounting the article with the wrapper partly formed thereabout on a conveyor mechanism which is provided with means for moving the conveyor to folding position, and which is provided with new and improved means for effecting a "druggist fold" longitudinally of the article in predetermined steps.

A further object of the invention is to provide new and improved means for conveying an article to a predetermined position and then intermittently operate devices to effect a "druggist fold."

Another object of the invention is to provide a wrapping machine which is provided with an oscillating tucker blade to tuck the free ends of a wrapper in a predetermined manner, which is provided with an oscillatory folder to turn the free ends in a predetermined position, and which is provided with an oscillatory folder bar cooperating with the oscillatory movement of the folder to effect the proper folding arrangement.

A still further object of the invention is the provision of new and improved means for successively causing folds or bends in the free edges of the wrapper and then finally turning and folding the free edges of the wrapper to comprise a longitudinal seam or fold of the type normally called a "druggist fold," the parts causing the various folding operations being properly correlated and synchronized so as to operate at proper time intervals.

Numerous other objects and advantages will be apparent throughout the progress of the following specification.

The accompanying drawings illustrate a selected embodiment of the invention and the views therein are as follows:

Fig. 1 is a detail longitudinal sectional view of a wrapping machine showing some of the mechanism for effecting the folding operation;

Fig. 2 is a detail sectional view on the line 2—2 of Fig. 1;

Figs. 3 to 6, inclusive, are detail sectional views of some of the folding mechanism showing the various folding steps;

Fig. 7 is a detail sectional view of an article showing the complete fold; and

Fig. 8 is a detail elevational view of some of the operating structure, on the line 8—8 of Fig. 2.

The particular machine herein shown for the purpose of illustrating the invention includes mechanism for forming a "druggist fold" in the wrapper in which the article is wrapped. The wrapper is in the form of a sheet of pre-cut paper 10 in which the article 11 is to be wrapped, Fig. 1. The sheet 10 is fed to a predetermined position where it is engaged by the article to be wrapped and forced into position in a pocket or holder 12 in a conveying mechanism 13. The mechanism 13, in the present instance, comprises a wrapping wheel 14, although it is to be understood that a straight line conveyor, or any other conveying mechanism capable of performing the function, may be used. The holder or pocket members 12 in the embodiment herein shown comprise pivotally mounted spring pressed fingers 15 projecting radially from the wrapping wheel 14, and co-operate with the other parts of the holder or pocket members 12 to support the articles.

The wrapping wheel 14 comprises a pair of spaced disks or plates 16 and 17, Fig. 2, which are mounted for rotation on a rotating shaft 18. The disks or plates 16 and 17 are of relatively rigid construction, preferably being made of cast iron. The disk 16 is fixed to the shaft 18 by means of a pin 19, while the disk 17, being splined to the shaft 18, is free to be moved inwardly and outwardly so as to accommodate articles of different lengths. The disk or plate 17 may include a collar 20 rigidly connected thereto so that the disk may be operated by a plate 21 to move the disk longitudinally along the shaft 18, Fig. 2. The disks or plates 16 and 17 rotate together and form the wrapping wheel 14 which supports the articles 11. Each of the disks includes the holders 12 and fingers 15 which are in alinement to receive the article 11 to be wrapped, the article being supported at its ends by the parts 12 and 15 on the disks 16 and 17. The shaft 18 is intermittently rotated by means of a Geneva motion comprising a Geneva wheel 22 and a driver 23. The driver 23 is mounted on a suitably driven shaft 24, whereby rotation of the shaft 24 will operate the driver 23. The driver 23 engages the surfaces surrounding the slots 25 in the Geneva wheel and causes intermittent rotation of the wheel.

The article 11 with its cut wrapper 10 partly formed thereabout is moved by the wrapping wheel 14 to folding position, as shown in Fig. 1, and more particularly as shown in Fig. 3. As the article with its wrapper is moved to folding position, the upper edge 26 of the wrapper, Fig.

3, will be engaged by a finger 27 which tends to force the free edge 26 in a downwardly direction toward the article, in the position shown in Fig. 3. The article with the wrapper is maintained in the position shown in Fig. 3 for a predetermined length of time until the wrapper is engaged by a tucker blade 28. The tucker blade 28 moves in an arcuate direction, being fixed to a shaft 29. As the tucker blade swings to operative position it will first engage the side or edge 30 of the wrapper 10, Fig. 3, and then fold the free ends of the wrapper into a folding pocket 31, Fig. 4. The folding pocket 31 is formed by the relative position of a folder member 32 with respect to a folder bar 33, Fig. 4.

The lower edge of the finger 27, Figs. 3 and 4, extends a predetermined distance below the flat straight surface 34 of the folder 32 so as to maintain the free ends of the tucked-in wrapper in the position shown in Fig. 4 during the return movement of the tucker blade 28. As the tucker blade 28 recedes to inoperative position, the folder 32 is given a part rotation, causing the extending free ends of the wrapper to be folded down against the side of the wrapper and become somewhat squeezed between the folding bar 33 and the flat side 34 of the folder 32, as shown in Fig. 5.

The folder 32 comprises a transverse shaft 35, Fig. 2, part of which is cut to provide the flat side 34. The shaft 35 is suitably mounted in a part 36 rigid with a part of the machine frame 37. The shaft 35 has a pinion 38 rigidly fixed thereto, being positioned immediately behind the bearing portion 36, which is driven by a segment 39, Fig. 2. The segment 39 is loosely mounted on the shaft 18 and carries a cam roller 40 which engages a race or groove in a cam 41. The cam 41 is rigidly secured to a main drive shaft 42 which is operated by a gear 43 driven in any suitable manner, such as by an electric motor, not shown. The main drive shaft 42 may also operate the driver 23 to drive the Geneva wheel 22. Rotation of the shaft 42 causes oscillatory movement of the segment 39, such oscillatory movement being transmitted to the shaft 35, causing oscillatory movement of the folder 32. The oscillatory movement of the folder 32 is through an arc of approximately one hundred twenty degrees, the folder moving from its normal position, shown in Fig. 3, to its final folding position, shown in Fig. 6.

The tucker blade 28 is mounted on a lever 44 rigidly secured to the shaft 29 which is mounted for oscillatory movement. The shaft 29, upon which the tucker blade 28 is mounted, is operatively mounted in a suitable bearing formed as a part of the supporting frame 37, and is oscillated by an operating lever 45, Fig. 1, which is fixed to the shaft 29. The lever 45 is connected by means of a link 46 to a cam lever 47 which is in the form of a bell crank, Fig. 1. The bell crank 47 has its arm 48 carrying a cam roller 49 which co-operates with a groove in a cam 50 rigidly mounted on the main drive shaft 42, Fig. 2.

The mechanisms for operating the wrapping wheel 14, the folder 32, and the tucking blade 28 are properly correlated and synchronized to operate in proper timed relationship with respect to each other to perform the successive folding operations at the proper time intervals.

After the tucking blade 23 has tucked the wrapper in the position shown in Fig. 4, and the folder has moved to the position shown in Fig. 5, the folder bar 33 is caused to oscillate in the same direction as the oscillatory movement of the folder 32, moving from the position shown in Fig. 5 to the position shown in Fig. 6. During this latter oscillatory movement of the folder, the next intermittent movement of the wrapping wheel takes place, causing the package to be moved from the position shown in Fig. 5 to the position shown in Fig. 6. The fold is then pressed down against the body of the package as the package is forced beneath a stationary guide 51 and a completed fold 52 is formed, as shown in Fig. 7. The stationary guide 51 is secured to a block 53, Figs. 3 to 6, mounted on a bracket 54 by means of cap screws 55. The retaining finger 27 may likewise be made rigid with the bracket 54 by means of screws 56, Fig. 1.

The folding bar 33 is in the form of a longitudinal bar relatively rectangular in cross section, as shown in Figs. 3 to 5. The left end, Fig. 2, of the bar 33 terminates in a circular shaft 57 which is mounted in a bearing comprising a spring mounted block 58 and a rigid bearing part 59. The part 59 of the bearing is formed integral with the bracket 54 which is rigidly secured to a part of the supporting frame structure 37, Fig. 2. The bearing part 58 frictionally engages the shaft 57 because of the springs 60, thereby maintaining friction against the shaft so that the shaft is maintained in its moved position.

The folding bar 33 is given delayed oscillatory movement by an operating arm 61 rigidly mounted to the end of the shaft 35, which comprises an integral part of the folder 32. The operating arm 61 carries an operating pin 62, Fig. 2, which co-operates with a yoke member 63 rigidly secured to the circular shaft part 57 of the folder bar 33. The operating arm 61 is fixed to the end of the shaft 35 (to the left, Fig. 2) by directly fastening it thereto by a screw 64, Fig. 8, threadedly engaging the end of the shaft. The arm 61 may be provided with a cut-out or notched portion 65 to allow the folder bar 33 to oscillate independently of the operating arm 61.

The yoke 63 comprises a straight portion arranged between two projecting fingers 66 and 67, Figs. 3 to 6. The shaft part 57 of the folding bar 33 derives its movement from the folder 32 by means of the pin 62 engaging the yoke 63. When the folder shaft 35 oscillates, the pin 62 is given oscillating movement which is partly transmitted to the yoke 63 by engagement with either of the projecting fingers 66 and 67. The oscillatory movement of the pin 62 has no effect on the yoke 63 during movement of the pin between the fingers 66 and 67. However, as shown in Fig. 5, when the pin 62 is in engagement with the finger 67 on the yoke 63, the yoke 63 is caused to swing on its pivot with the shaft 57, thereby transmitting motion to the folder bar 33, moving it from the position shown in Fig. 5 to the position shown in Fig. 6. As the folder 32 returns to normal inoperative position, the pin 62 will engage the finger 66 and return the yoke from the position shown in Fig. 6 to its normal position shown in Figs. 3 and 4.

The folder 32, which includes the shaft 35 and the flat side 34 thereon, is under-cut, as shown at 68 and 69 in Fig. 2, to accommodate the retaining finger 27 and to cause the same to lie in close proximity to the center of the shaft and to be positioned properly with respect to

the ends of the wrapper to retain them in the position shown in Fig. 4.

The sheet 10 is fed by feed rollers 70, Fig. 1, to a stop member 71 where it is engaged by the article 11 which moves in the direction indicated by the arrow so as to intersect the wrapper and move it in position in the pocket of a holder 12. The articles 11 are fed successively and intermittently to position to the conveyor where they are moved intermittently to folding position. The sheets 10 may be pre-cut or they may be fed from a continuous web of material and then cut to the proper size by cutters 72, Fig. 1.

Operation

The Geneva wheel 22 is moved intermittently to folding position by means of the driver 23. When the article with the wrapper 10 partly folded thereabout arrives at folding position, the tucker blade 28 will engage the overhanging free ends of the wrapper and tuck or fold them in the position shown in Fig. 4 whereby they will be engaged in the pocket and lying against the extended end of the finger 27. After the tucker blade 28 has formed the wrapper, as shown in Fig. 4, the tucker blade will return to normal inoperative position. During the return movement of the tucker blade, however, the folder 32 will be caused to move from the position shown in Fig. 4 to the position shown in Fig. 5, whereby the free ends of the wrapper will be squeezed together in the position shown in Fig. 5, lying between the flat side 34 of the folder 32 and the folder bar 33, Fig. 5. After the folder 32 has moved to a predetermined position, the pin 62 will engage a lug or finger 67 on the yoke 63 and cause the folder bar 33 to move from the position shown in Fig. 5 to the position shown in Fig. 6. The next intermittent movement of the Geneva wheel 22 will move the article with its wrapper beneath the forward edge of the stationary guide 51, whereby the fold 52 will be completed and tightly pressed against the side of the article, as shown in Fig. 7. After one complete fold has been made the folder 32 will move from the position shown in Fig. 6 to its normal position shown in Fig. 3. The return movement of the folder 32, however, will cause the pin 62 to engage the finger 66 on the yoke 63 and return the yoke 63 to normal position whereby the parts are ready to commence the next succeeding folding operation on the next wrapper.

In the formation of the fold 52, the upper part 26 of the wrapper 10 will be engaged by the finger 27, as shown in Fig. 3. The tucker blade 28 will then engage the underside 30 of the wrapper 10 and form a partial fold 80, Fig. 4, with a crease at the edge as indicated at 81, whereby there will be provided the downwardly extending free ends or flaps 82 and 83, the underside of the flap 83 engaging the outside of the side or edge 30 of the wrapper 10. This partial fold 80, Fig. 5, is then folded more tightly together because of the operation of the folder 32 squeezing or pressing the partial fold 80 against the folder bar 33. After the squeezing or pressing operation, the partial fold 80 is again squeezed more tightly together by the operation of the folder bar 33, as shown in Fig. 6. The folding operation is completed by bending or folding the material 10 at the point indicated at 84, Fig. 6. The forming of the fold 52 is finally completed by the pressing of the partial fold against the article whereby the free ends 82 and 83 will be turned underneath the partial fold 80 and against the body of the article. After the fold has been completed by the final folding at 84, Fig. 6, the guide 51 will cause the folded parts to lie tightly and firmly against the body of the article in the manner as shown in Fig. 7.

The folding operation, therefore, consists generally in having the folder blade fold the free ends of the wrapper in a direction toward the article being wrapped to form a partial fold, and then folding the two parts 26 and 30 of the wrapper at a point below the free ends of the partial fold, as indicated by the numeral 84. This fold or crease 84 is effected reversely as regards the part 30 of the wrapper, but extends lengthwise or tangentially with respect to the part 26 of the wrapper.

After the longitudinal fold 52 is provided, end tucking means (not shown) are provided for folding and tucking in the wrapper at each end of the article.

The invention provides a machine comprising rigid and durable parts which are properly synchronized to form successively certain folding steps or operations in accordance with a predetermined plan. The parts are rigid and durable in construction, efficient in operation and are properly synchronized, being driven from a common prime mover so as to assure proper operation in the proper sequence.

Changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

The invention is hereby claimed as follows:

1. A wrapping machine for forming a druggist fold comprising means for positioning an article and wrapper in a predetermined relationship with the wrapper engaging a predetermined part of the article and the free ends of the wrapper spaced apart and projecting outwardly a predetermined distance, a folder bar normally positioned relatively close to said article and having a folding surface normally extending in a direction generally perpendicular to the surface of the article, a rotatable folder having a substantially flat surface cooperating with said surface of the folder bar to provide an angular folding pocket having a relatively wide opening, a pivotally mounted tucker blade swingable into and out of said pocket for bringing said free ends into contacting relationship and partially folding the contacting ends within the pocket, and means for rotating said folder with respect to said folder bar to decrease the angle of said pocket and effect further folding of the wrapper against said surface of the folder bar.

2. A wrapping machine for forming a druggist fold in a wrapper about an article comprising an oscillating tucker blade engageable with the wrapper, a rotatable folder and a rotatably mounted folder bar co-operating with the tucker blade to partially fold the free ends of the wrapper together and position the free ends of the wrapper a predetermined distance from the fold, means for rotating said folder to form a fold in the wrapper, and means driven by said folder after a predetermined rotation thereof for rotating said folder bar to press the fold down against the article.

3. A wrapping machine comprising means for maintaining a wrapper in a predetermined position, and means for folding said wrapper com-

prising a tucker blade, a rotatable folder having a flat side, a rotatable folder bar having a flat side cooperating with the folder to provide a pocket, means for moving the tucker blade into contacting relationship with the wrapper to partially fold the wrapper in said pocket, means for returning the tucker blade to normal position, means for effecting rotation to the folder when the tucker blade returns to normal position, and means co-operating between the folder and the folder bar to drive the folder bar from the folder after a predetermined rotation of the folder.

4. A wrapping machine comprising means for maintaining a wrapper in a predetermined position, and mean for folding said wrapper comprising a tucker blade, a folder having a flat side adapted for engagement with a part of the wrapper, means for moving the tucker blade into contacting relationship with the wrapper, means for returning the tucker blade to normal position, means for effecting a part rotation to the folder when the tucker blade returns to normal position, a folder bar co-operating with the folder, means for returning the folder to initial position, and means including a loose driving connection between said folder and said folder bar for oscillating said folder bar during predetermined portions of rotation of the folder.

5. A wrapping machine comprising means for maintaining a wrapper in a predetermined position with respect to an article partially enclosed therein, and means for folding said wrapper comprising a folder bar normally positioned relatively close to said article and having a folding surface normally extending in a direction generally perpendicular to the surface of the article, a rotatable folder having a substantially flat surface cooperating with said surface of the folder bar to provide an angular folding pocket having a relatively wide opening, a pivotally mounted tucker blade swingable into and out of said pocket to partially fold the free ends of the wrapper therein, and means for rotating said folder while maintaining said folder bar substantially stationary to decrease the angle of said pocket and effect further folding of the wrapper against said surface of the folder bar.

6. A wrapping machine comprising means for maintaining a wrapper in a predetermined position with respect to an article partially enclosed therein, and means for folding said wrapper comprising a folder bar normally positioned relatively close to said article and having a folding surface normally extending in a direction generally perpendicular to the surface of the article, a rotatable folder having a substantially flat surface cooperating with said surface of the folder bar to provide an angular folding pocket having a relatively wide opening, a pivotally mounted tucker blade swingable into and out of said pocket to partially fold the free ends of the wrapper therein, means for rotating said folder with respect to said folder bar to decrease the angle of said pocket and effect further folding of the wrapper against said surface of the folder bar, and means for thereafter rotating said folder and folder bar in unison.

7. A wrapping machine comprising means for maintaining a wrapper in a predetermined position with respect to an article partially enclosed therein, and means for folding said wrapper comprising a folder bar normally positioned relatively close to said article and having a folding surface normally extending in a direction generally perpendicular to the surface of the article, a rotatable folder having a substantially flat surface cooperating with said surface of the folder bar to provide an angular folding pocket having a relatively wide opening, a pivotally mounted tucker blade swingable into and out of said pocket to partially fold the free ends of the wrapper therein, and a member normally extending over a portion of the opening of said pocket and engageable with the free ends of said wrapper to maintain the partially folded wrapper in the pocket upon withdrawal of said tucker blade.

8. In a wrapping machine of the character described, a rotatable shaft having a flattened portion providing a folder surface, a folder bar positioned eccentrically with respect to the axis of said shaft and mounted for rotation about said axis, said folder bar having a folder surface cooperating with said surface of the shaft, means for effecting predetermined rotation of said shaft with respect to said folder bar, and means for thereafter rotating said shaft and folder bar in unison.

9. In a wrapping machine of the character described, a rotatable shaft having a flattened portion providing a folder surface, a folder bar positioned eccentrically with respect to the axis of said shaft and mounted for rotation about said axis, said folder bar having a folder surface cooperating with said surface of the shaft, means for effecting predetermined rotation of said shaft with respect to said folder bar while maintaining said folder bar substantially stationary, and means for thereafter rotating said shaft and folder bar in unison.

10. In a wrapping machine of the character described, a rotatable shaft having a flattened portion providing a folder surface, a folder bar positioned eccentrically with respect to the axis of said shaft and mounted for rotation about said axis, said folder bar having a folder surface cooperating with said surface of the shaft, means for effecting predetermined rotation of said shaft with respect to said folder bar, resilient bearing means for maintaining said folder bar substantially stationary during said predetermined rotation of the shaft, and means for thereafter rotating said shaft and folder bar in unison.

11. In a wrapping machine of the character described, a rotatable shaft having a flattened portion providing a folder surface, a folder bar positioned eccentrically with respect to the axis of said shaft and mounted for rotation about said axis, said folder bar having a folder surface cooperating with said surface of the shaft, means for effecting predetermined rotation of said shaft with respect to said folder bar, and means on said shaft cooperating with means on said folder bar for thereafter rotating said shaft and folder bar in unison.

12. In a wrapping machine of the character described, a rotatable shaft having a flattened portion providing a folder surface, a folder bar positioned eccentrically with respect to the axis of said shaft and mounted for rotation about said axis, said folder bar having a folder surface cooperating with said surface of the shaft, means for rotating said shaft through a predetermined angle of oscillatory movement, and means including a loose driving connection between said shaft and said folder bar for rotating the folder bar in unison with the shaft during a portion of the oscillatory movement of the shaft.

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