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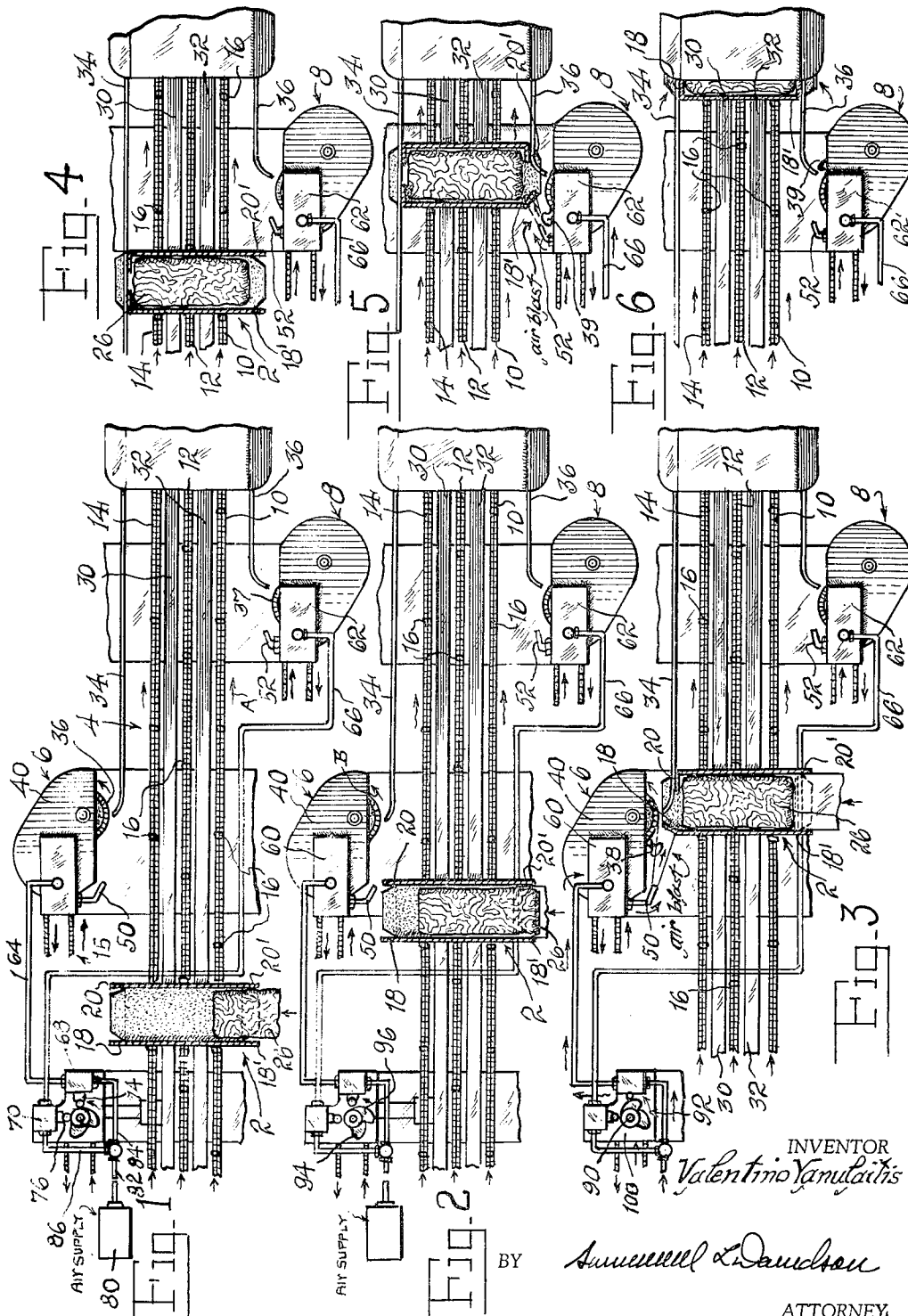
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CARTON FLAP FOLDING APPARATUS

Filed June 1, 1961

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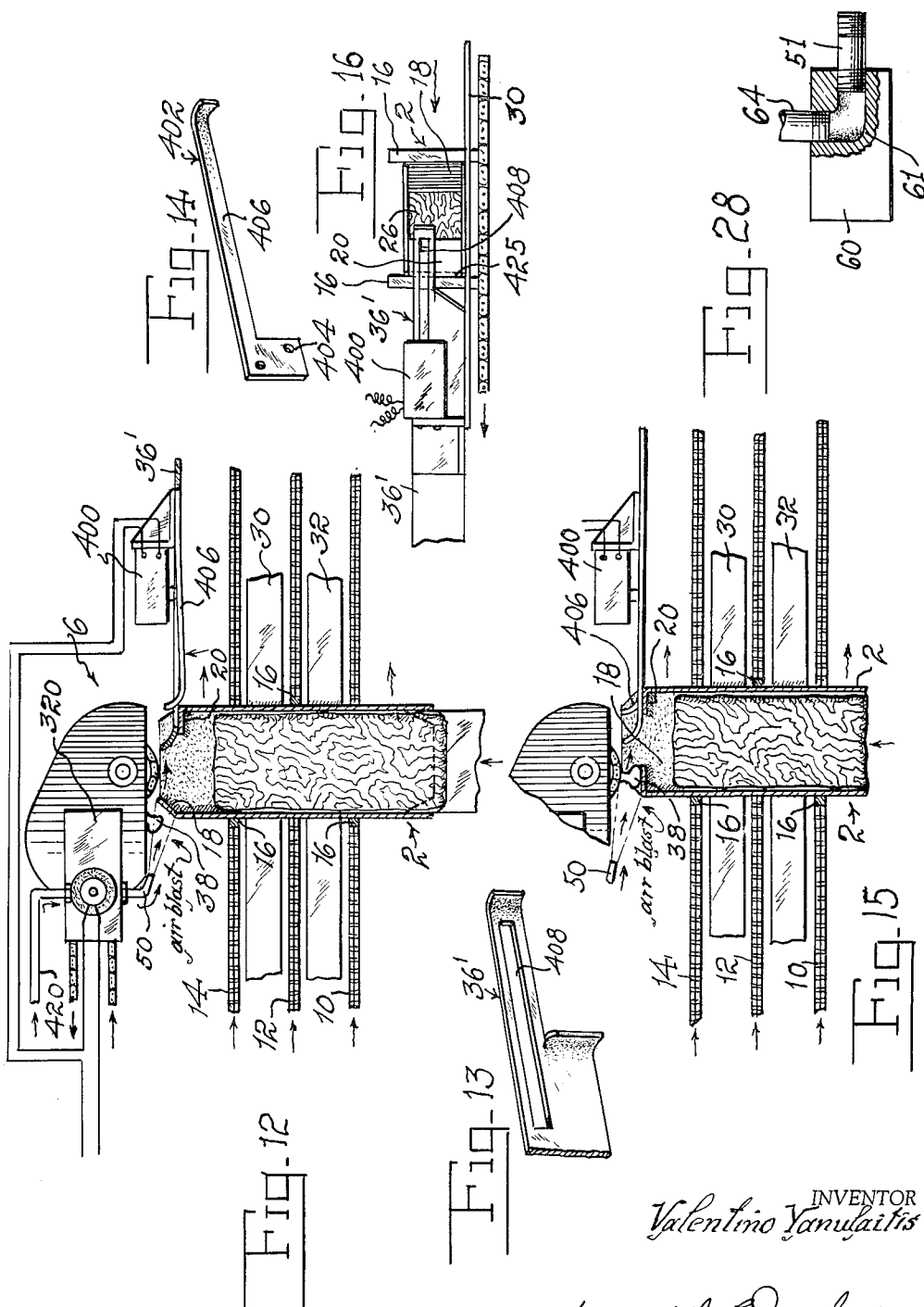
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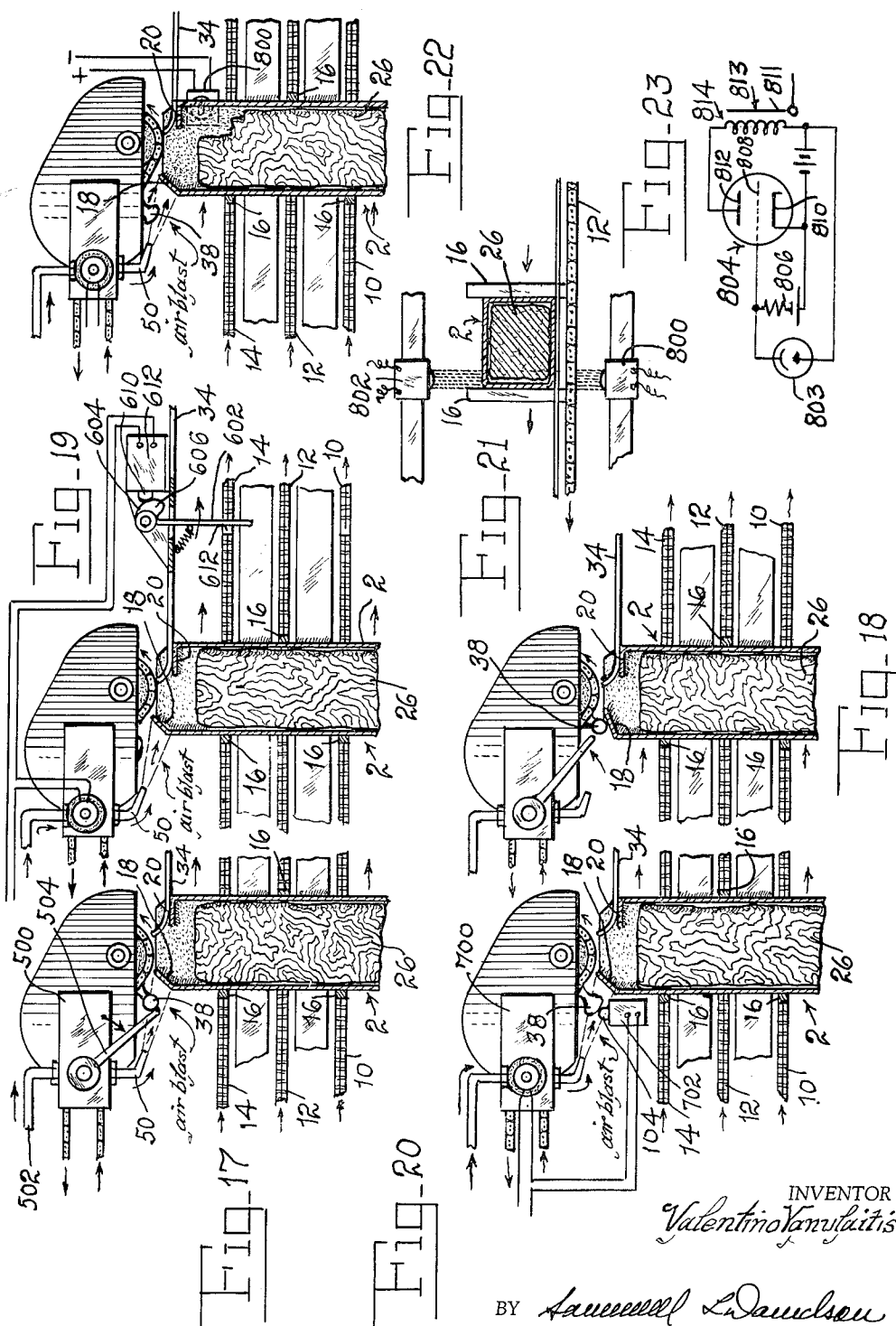
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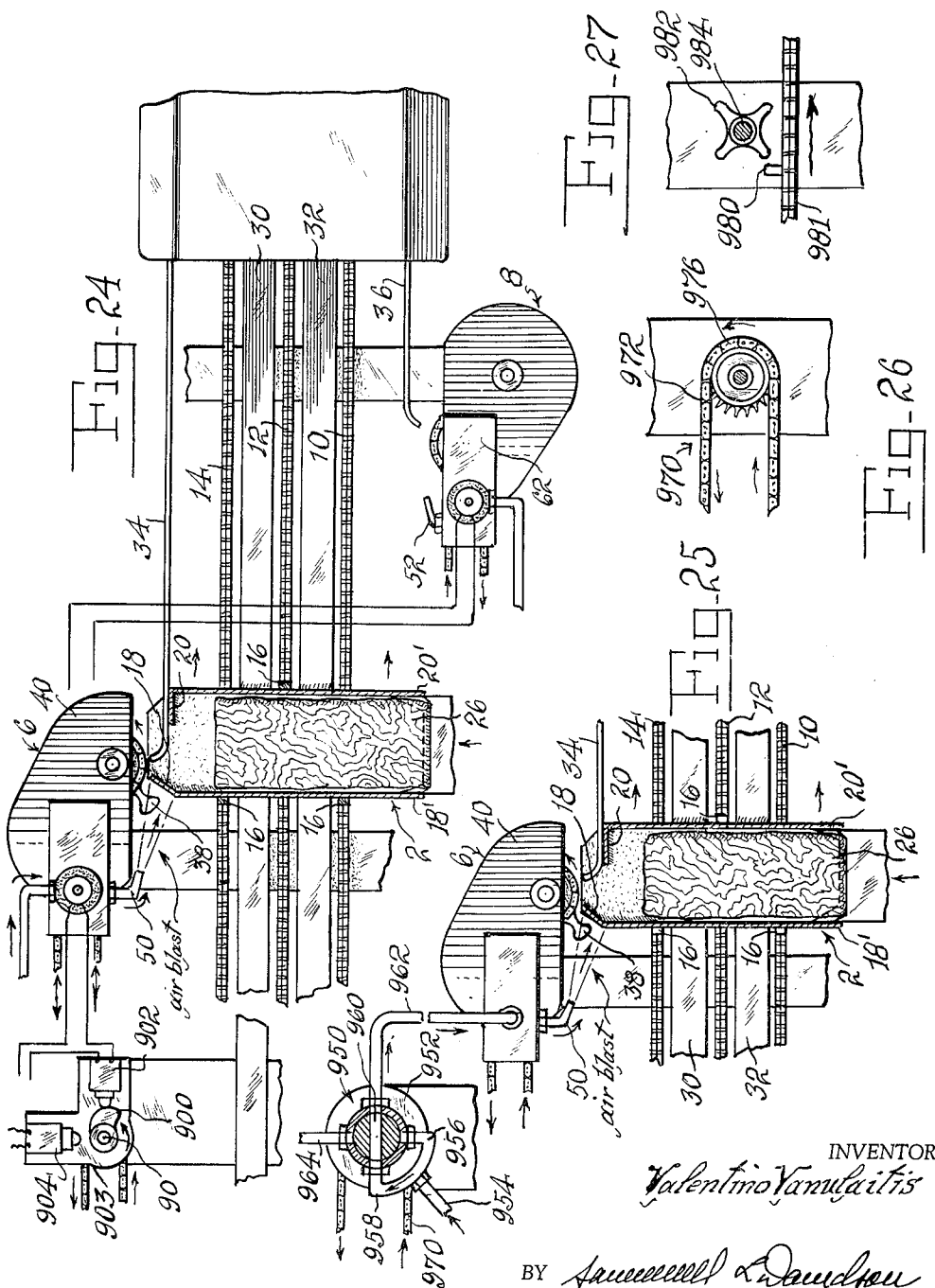
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CARTON FLAP FOLDING APPARATUS

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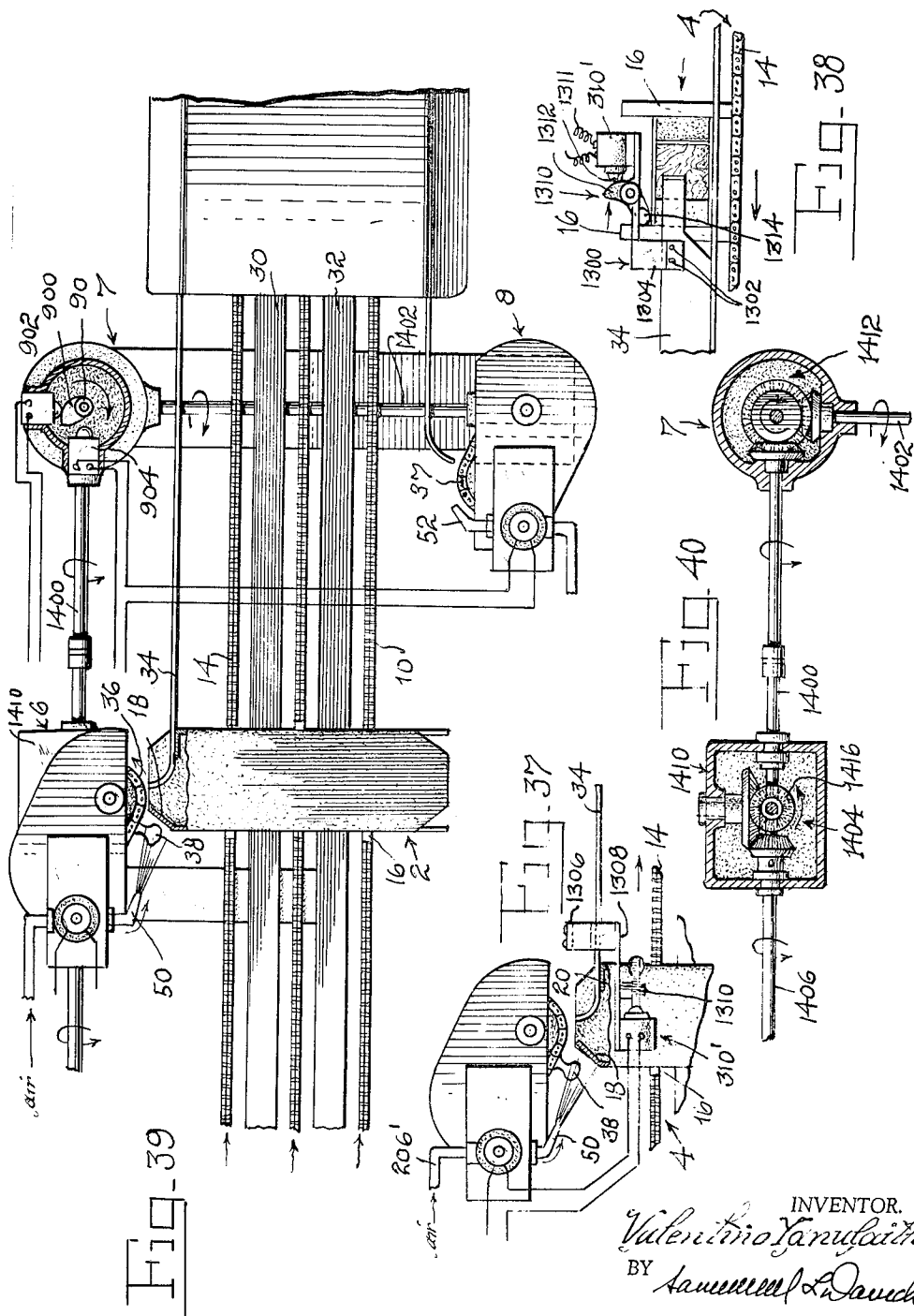
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CARTON FLAP FOLDING APPARATUS

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CARTON FLAP FOLDING APPARATUS

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23 Claims. (Cl. 53—374)

This invention relates to packaging apparatus, and more particularly to automatic packaging apparatus of the type adapted to automatically fold inwardly flaps hinged to, and projecting from, packages being conveyed through the apparatus.

The art relating to machines for automatically packaging various types of items has been highly developed. Previous suggestions have been made as to the manner in which an overwrap may be automatically folded about a carton, as to the manner in which reciprocating plungers may be utilized for automatically causing insertion of items within a carton or closing carton members, and as to the manner in which guide rails and the like can be assembled in combination with a conveyor to operate upon carton components to effect movement thereof to a "closed" position. Some of the more widely used automatic packaging apparatus incorporates means for conveying packages having a member to be moved to the closed position thereon, past means for mechanically folding such member to closed position.

While the particular conveyor means incorporated, and the particular means for effecting mechanical folding vary from machine to machine, one of the major folding problems encountered concerns the achievement of an automatic positive folding operation which insures proper "closing" of a projecting hinged flap so that the free end of such flap points in at least the general direction of movement of the package being conveyed. Consider for example a carton having two outwardly projecting hinged "dust" flaps which extend in the vertical plane, and assume that this package is being moved horizontally through an automatic packaging machine. One of the outwardly extending vertically disposed flaps must be folded inwardly so that the free end thereof points in a direction opposite the direction of movement of the carton. This is rather easily achieved by providing a guide rail which engages the flap as the carton is moved therepast.

Although the one flap may be folded inwardly in the manner described above, the opposed flap must be folded inwardly so that the free end thereof points in the general direction of movement of the package through the apparatus. If no operation were performed on this other flap, and the same were allowed to merely engage the guide rail, then it is likely that the same would be folded backwardly so that the free end points in a direction opposed to the direction of movement of the package, i.e., it would be folded in the same manner as the first flap discussed above, and not to its own closed position.

To accomplish inward folding, as opposed to the undesired backward or outward folding, the automatic packaging machines have been provided with means which mechanically engage the other flap, i.e., the flap to be folded inwardly so that its free end points in the general direction of movement of the package. The means for engaging such other flap causes the same to be initially folded inwardly to such an extent that as the free end thereof engages a guide rail, the guide rail causes further inward folding or proper closing.

If the other flap referred to above projects directly to one side of the axis of the carton, then the mechanical means for engaging such other flap to initially fold the same partially inwardly normally functions satisfactorily. However, in many instances such other flap is not in projecting alignment with the axis or side of the package

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being conveyed through the apparatus. It may be directed slightly inwardly, or it may be directed slightly, or to a substantial extent, outwardly. If directed inwardly, again, there is not likely to be any problem.

However, if the flap projects outwardly then the means for mechanically folding the same inwardly can engage and crush such flap, as opposed to folding it inwardly, or alternatively, it can "miss" the flap completely and cause no folding thereof whatsoever.

The present invention is directed to improvements in automatic packaging apparatus which operates in the manner outlined above. More specifically, a primary object of the present invention is to provide in a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement which comprises an assembly of means operated synchronously with movement of the packages, which assembly "assists" the mechanical folding operation by insuring positive initial inward folding of the projecting flap in question so that the same is in proper position for engagement by the mechanical means for automatically folding the flap inwardly.

A still further general and principal object of the present invention is to provide in a packaging apparatus of the aforesaid type, means for causing an "air blast" or "fluid stream" to be directed against the flap to be folded inwardly whereby the free end thereof points in the general direction of movement of the package through the apparatus, which means serves to insure positive initial inward folding of the flap in question so that there is, in every instance, proper engagement of such flap by mechanical folding means subsequently operating thereon.

Still further, yet more specific primary objects of the present invention are: (a) to provide in a packaging apparatus of the type described above, an assembly which serves to insure proper "flap folding" and which comprises the combination of nozzle means for directing fluid delivered thereto against the flap to be folded inwardly, supply means for delivering fluid under pressure to the nozzle means, valve means connecting the nozzle means with the supply means, and control means for operating the valve means to pass fluid therethrough from the supply means to the nozzle means as the package approaches and is at least initially engaged by the means for mechanically folding the flap inwardly; (b) to provide an assembly conforming with the preceding specific object which is readily adapted for use on varying types of existing packaging equipment; (c) to provide an assembly conforming with the preceding objects wherein, depending on the particular machine utilized, and the particular components available, cam means can be used as part of the control means, or wherein photoelectric sensing means can be used to achieve the necessary control; (d) to provide an assembly conforming with all of the preceding objects wherein existing mechanical components and expedients can be utilized to construct the combination provided by the present invention at minimum cost; (e) to provide such an assembly wherein synchronization between the drive for the main apparatus components and the drive for the assembly provided by the present invention can be easily achieved, and wherein, if desired, the same drive means can serve a dual purpose; (f) to provide such an assembly wherein various types of valve means can be used to effect controlled transfer of air or fluid under pressure from a supply to a folding nozzle, and to provide particular valve means and particular valve operating systems which insure trouble-free and advantageous operation; (g) to provide an

assembly as prescribed in sub-paragraph (a) above wherein the means for mechanically folding includes the nozzle means; (h) to provide an assembly conforming with any and all of the preceding objects which at most requires slight modification to existing equipment when connecting the assembly with such equipment to facilitate packaging thereby; and (i) to provide such an assembly which is readily adapted to facilitate folding of one flap or a plurality of flaps, whether the same be horizontally, vertically or angularly disposed.

The invention is particularly advantageous when used in combination with a packaging apparatus adapted to close carton dust flaps and including (a) means for mechanically folding a flap inwardly, (b) conveyor means for moving a carton past the means for mechanically folding the flap, and (c) means for driving the conveyor means. In its broad and general aspects, the assembly provided by the invention comprises the combination of activatable means for directing air against a carton flap to start folding of the same inwardly, and means driven by the conveyor drive means for activating the means for directing air as a carton approaches the means for mechanically folding, whereby the flap is initially folded partially inward by air before being engaged by the means for mechanically folding. The activatable means includes an outlet disposed immediately in advance of the means for mechanically folding in the path of movement of a carton in the apparatus or alternatively an outlet forming part of the means for mechanically folding.

The preferred embodiments of the invention provide for constructing the various means which function in the above described manner in particular combinations.

The invention will be better understood, and objects other than those specifically set forth above will become apparent, when consideration is given to the following detailed description thereof. Such description refers to the annexed drawings presenting preferred and illustrative embodiments of the invention. In the drawings:

FIGURE 1 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus having the improved "assist assembly" provided by the present invention operating thereon, and showing a package to be operated upon approaching one of the flap folding mechanisms;

FIGURE 2 is a fragmental plan view like FIGURE 1, but FIGURE 2 shows the flap-folding section components and package as the same would appear relative to one another when the package is moving adjacent the first of the flap-folding mechanisms;

FIGURE 3 is a fragmental plan view similar to FIGURE 2, but presenting the flap-folding mechanisms and package as the package moves into position where it is directly operated upon by the first of the flap-folding mechanisms;

FIGURE 4 is a fragmental plan view like FIGURES 1, 2, and 3, but FIGURE 4 presents the package and flap-folding mechanisms as the package has passed the first flap-folding mechanism and is approaching the second of such mechanisms;

FIGURE 5 is also a fragmental plan view showing the package and flap-folding mechanisms operated in accordance with the invention, but FIGURE 5 presents the relationship between the package and the mechanisms as the package is being directly operated upon by the second of the flap-folding mechanisms;

FIGURE 6 is a fragmental plan view like FIGURES 1 through 5, inclusive, but FIGURE 6 shows the relationship between the package and the mechanisms as the package has passed the first and second mechanisms;

FIGURE 7 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating a modified form of "assist assembly" provided by the present invention, and shows the same as operating directly upon one end of a package being conveyed through an automatic packaging apparatus;

FIGURE 8 is a fragmental detailed view showing the preferred construction of the valve means incorporated in the assembly of FIGURE 7;

FIGURE 9 is a plan view of the flap-folding section of an automatic packaging apparatus incorporating another modified form of "assist assembly" constructed in accordance with the present invention, and shows the same as operating on one end of a package being transferred or conveyed through the apparatus;

FIGURE 10 is a fragmental side view of the apparatus shown in FIGURE 9;

FIGURE 11 is a fragmental detailed view taken on the line 11-11 of FIGURE 10 and showing the modified assembly presented therein as the same would appear from the bottom;

FIGURE 12 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating still another modified form of "assist assembly" provided by the present invention;

FIGURE 13 and FIGURE 14 are side elevational views of components included in the modified "assist assembly" of FIGURE 12 for causing a selective switching control operation;

FIGURE 15 is a fragmental plan view like FIGURE 12, but presenting the components of the basic apparatus and of the modified "assist assembly" of FIGURE 12 as the same would appear when both dust flaps on one side of a carton have initially been folded inwardly to closed position;

FIGURE 16 is a side view of the assembly shown in FIGURES 12 through 15, inclusive;

FIGURE 17 and FIGURE 18 are fragmental plan views of the flap-folding section of an automatic packaging apparatus incorporating yet another modified form of "assist assembly" provided by the present invention wherein a conventional mechanical folding means is used itself to operate or activate the "assist assembly";

FIGURE 19 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating still another modified form of "assist assembly" provided by the present invention, and wherein the package being conveyed through the apparatus is used to mechanically and electrically activate the "assist assembly";

FIGURE 20 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating an additional modified form of "assist assembly" provided by the present invention, and wherein the conveying means of the apparatus is used to electrically and mechanically activate the "assist assembly";

FIGURE 21 is a fragmental side view of the flap-folding section of an automatic packaging apparatus incorporating a further modified form of "assist assembly" provided by the present invention, wherein photoelectric means is utilized to activate or control the "assist assembly";

FIGURE 22 is a plan view showing the operation of the modified form of "assist assembly" presented in FIGURE 21;

FIGURE 23 is a schematic circuit diagram presenting in simplified form the electrical connections used in the assembly presented in FIGURES 21 and 22;

FIGURE 24 is a fragmental plan view similar to FIGURE 1 of the flap-folding section of an automatic packaging apparatus, however, FIGURE 24 presents an electrically operated assembly being utilized on such apparatus in accordance with the present invention;

FIGURE 25 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating an "assist assembly" which is also similar to that shown in FIGURE 1, however, FIGURE 25 shows a "single" valve control for the assembly as opposed to the "double valve" construction of FIGURE 1;

FIGURE 26 is a fragmental detailed view showing the manner in which the control means of the assembly provided by the present invention may be driven;

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FIGURE 27 is a fragmental detailed view presenting a modified form of drive for the control means provided by the instant invention;

FIGURE 28 is a fragmental detailed side view, partially in section, of a support block used to couple a nozzle of the assembly provided hereby with a supply line;

FIGURES 29 through 32 are fragmental plan views of the flaps folding section of an automatic packaging apparatus having a modified "assist assembly" provided by the present invention incorporated thereon, and presenting the components of such modified assembly as they would appear in progressive operating positions when folding a carton flap being moved therepast;

FIGURES 33 through 36 are fragmental plan views of the flap-folding section shown in FIGURES 29-32, however, FIGURES 33-36 present the "assist assembly" actuating mechanism as the same would appear in the respective operating positions with the folding arm removed therefrom.

FIGURE 37 is a fragmental plan view of the flap-folding section of an automatic packaging apparatus incorporating still another modified form of "assist assembly" constructed in accordance with the present invention, which modified form is similar in many respects to the modified construction presented in FIGURES 9 through 11;

FIGURE 38 is a fragmental side view of the apparatus shown in FIGURE 37;

FIGURE 39 is a plan view corresponding to FIGURE 24, but showing an apparatus constructed in accordance with the present invention having the tucking stations thereof mechanically driven by suitable shafts extending from a coder drive housing; and

FIGURE 40 is a fragmental plan view, partially in section, presenting the preferred gear arrangement incorporated in the apparatus of FIGURE 39.

Overall assembly and operation

In FIGURE 1, the numeral 2 generally designates a package which is being moved by means of an endless conveyor 4 past two flap-folding stations 6 and 8. Located at each of the stations 6 and 8 is a means for mechanically folding a carton flap inwardly.

The conveyor 4 includes a series of endless chains 10, 12, and 14 which are driven in any conventional manner so as to move horizontally past the stations 6 and 8 in the direction of arrows A. The conveyors have attached thereto conventional package posts such as those designated by numeral 16. These posts support the package in a predetermined location by engaging opposite sides thereof. The package, as shown in the figures of the drawings for exemplary purposes is generally rectangular in shape, and has protruding from opposite ends thereof the dust flaps 18, 20 and 18' and 20'.

Also protruding from opposite ends of the carton 2 are the outside seal flaps 22, 22'. The carton 2 is shown in section in FIGURE 1, and as a result only the bottom outside seal flaps are depicted. It will be understood, however, that top outside seal flaps identical with those designated by numerals 22 and 22' are provided at the top of the carton.

The invention can be operated to assist or even cause folding of any carton flaps, but since it finds particular utility in aiding "dust" flap-folding, the following description explains operation only in connection therewith.

The end dust flaps 18, 18' and 20, 20' project outwardly from the carton during initial entry of the carton into the apparatus. The carton, when first placed on conveyor means 4, is positioned between the supports 16, and then a suitable plunger, in accordance with conventional practice, moves along a path at right angles to the conveyor 4 causing the article 26 to be packaged to move into the package 2 between the ends thereof. In FIGURE 1, the article 26 is shown as being initially moved into the carton, in FIGURE 2 the article 26 is shown as

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being almost moved completely within the carton, and in FIGURE 3 the article 26 is shown in its final position with the carton. Of course, to insure proper operation, the conventional machines incorporate means for moving the plunger in the direction of the conveyor as the same are serving to move the product 26 into the package. The conveyor chains 10, 12, and 14 move on opposite sides of article slide supports 30 and 32 whereby a minimum of friction is encountered by the carton or package 2 in moving through the apparatus.

Since the plunger means used for inserting an article in a package, the particular form of conveyor, and the means for driving the particular form of conveyor, are conventional, it is believed sufficient to merely describe the operation thereof in general as above.

In addition to incorporating the conveyor, a drive for the conveyor, article supports, and the like, a conventional packaging machine usually includes some form of fold guide rails such as those designated by numerals 34 and 36, and some form of mechanical tucker such as those shown at stations 6 and 8. These guide rails are disposed on opposite sides of the conveyor, as are the conventional mechanical folders or tuckers which comprise an endless chain conveyor such as that designated by numeral 36, adapted to move a folding head such as that designated by numeral 38 (FIGURE 3) into a position to engage a carton flap. The tucker conveyor chain 36 moves within a housing 40, but as appreciated by those of ordinary skill in the art, in the exemplary apparatus shown, such conveyor chain 36 would merely travel in a horizontal path so as to move the folding head 38 into and out of engagement with a carton flap in the manner described below.

The conveyor 4, or more particularly moving chains 10, 12, and 14 thereof, cause the package to advance to the right as shown in the accompanying drawings. The article to be packaged, namely article 26, is moved into the package at the same time to inward folding of the flaps. This inward movement is depicted in FIGURE 1, FIGURE 2, and FIGURE 3 respectively as explained above. By reference to FIGURE 3, it will be noted that as the carton 2 approaches the guide rail 34, the flap 20 is folded inwardly by the guide rail. This flap normally projects laterally of the carton to the side of the conveyor and unless it is directed outwardly and at exactly right angles to the package 2, the rail 34 engages the flap 20 and folds the same inwardly as shown in FIGURE 3.

Without more, the flap 18 would not fold-in in the same manner. Consider for example FIGURE 3 and assume the package is moved to the right as shown. The flap 18 would be engaged by the rail 34, and would be folded outwardly or backwardly. This is in direct opposition to the desired closing operation. For this reason, the conventional machine presented in the drawing incorporates the head 38 which moves around in the direction of arrow B in timed sequence to movement of the package through the apparatus whereby the head 38 supposedly engages the flap 18 and folds the same inwardly so that it can be permanently maintained in inwardly folded position by the guard rail 34. The maintenance in permanent inward folded position is shown in FIGURE 4.

Now, in accordance with the invention, the inward folding of the flap 18 so that the same is ultimately properly positioned by the guide rail 34 is not left to control of the tucking head 38 alone. Instead, before the tucking head 38 engages the flap 18, an air blast is passed through the nozzle 50 whereby it is directed onto the flap 18. The air blast causes inward folding of the flap 18 regardless of its previous position so that it will be properly engaged by the head 38, and thus ultimately positively properly positioned by the guide rail 34.

After the package 2 has passed the first folding station 6, it moves to the second folding station 8 where a corresponding operation is performed on the outwardly pro-

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jecting dust flaps 20' and 18'. The dust flap 20' does not cause any problem because the guide rail 36 engages the same thereby folding it inwardly as desired. In order to properly fold-in the dust flap 18', however the invention provides for first directing an air blast thereon via the nozzle 52 as best shown in FIGURE 5. This air blast is caused to exist immediately prior to engagement of the flap 18' by the mechanical tucking head 39. The mechanical tucking head 39 is carried by a conveyor 37 and moves into and out of engagement with the flap 18' just as the mechanical tucking head 38 carried by conveyor 36 is caused to move in and out of engagement with the dust flap 18. The air blast insures positive inward folding of the flap 18' so that the same may be ultimately engaged by the guide rail 36 after it has been further inwardly tucked by the tucking head 39.

Once all of the folding operations have been performed, then the conveyor moves the package 2 past the second folding station 8 and onto subsequent operations. In FIGURE 6, the package is shown as leaving the second folding station with all of the dust flaps folded inwardly.

Specific construction and operation of preferred embodiment

In order to achieve sequential operation of the air blasts from the nozzles 50 and 52 respectively, the preferred embodiment of the "assist assembly" provided by the present invention and shown in FIGURES 1-6 incorporates nozzle supply or support blocks 60 and 62 which are coupled via fluid lines 64 and 66 with valves 68 and 70. Projecting laterally of each of the valves 68 and 70 is a cam actuated follower arm 74 and 76 respectively. A supply 80 is coupled via line 82 and branch lines 84 and 86 with the valves 68 and 70.

Carried by the vertical output shaft 90 of the conveyor drive 5 (FIGURE 10) is a double cam generally designated by the numeral 92 (FIGURES 1-3). The cam 92 includes cam lobes 94 and 96 disposed in vertically spaced relation so as to cooperate respectively with the follower arms 74 and 76 which are also disposed in vertically spaced relation whereby the follower arm 74 cooperates with cam lobe 96 and the follower arm 76 cooperates with the cam lobe 94. Upon rotation of the shaft 90 in synchronism with drive of the conveyor 4, the cam lobes 94 and 96 are caused to rotate whereby the cam lobe 96 initially engages the follower arm 74 thereby activating the valve or switch 68 so that the fluid passes from the supply 80 under pressure through the line 64 to the nozzle 50. This timed operation is so set that the nozzle 50 directs a blast of air against the flap 18 as the same approaches and is engaged by the mechanical folding head 38. Similarly, as the shaft 90 continues to rotate, the cam lobe 94 engages the follower arm 86 thereby causing activation of the valve or switch 70 and delivery through the conduits 66 of compressed fluid or air to the nozzle 52. Discharge of an air blast from the nozzle 52 occurs as the flap 18' approaches and is engaged by the mechanical folding head 39.

Summary of operation

Initially, a carton is placed on the conveyor 4 and between the supports which are previously properly spaced. Thereafter, the article to be packaged, namely article 26 as shown in the drawings is pushed into the package by means of suitable package pusher arms which are conventional. The package continues to move to the right as shown in the drawings. As it approaches the first station 6, the dust flap 20 is folded inwardly by the guide rail 34.

As the flap 18 approaches the mechanical tucking head 38, an air blast is directed thereagainst, which air blast issues from the nozzle 50 and causes the flap 18 to be initially folded inwardly whereby it is positively engaged by the tucker head 38. Thereafter, while engaged by the tucker head 38, the flap 18 is engaged by the rail 34.

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The package continues to move to the right, and the guide rail 36 engages the flap 20' thereby folding the same inwardly. As the flap 18' approaches the mechanical tucking head 39, an air blast issues from the nozzle 52 thereby folding the flap 18' inwardly for positive engagement by the tucking head 39 and final positive engagement by the guide rail 36.

With this operation, regardless of the position of the flap 18 or 18' as it approaches the mechanical tucking means, the air blast causes the same to move inwardly so that it is positively engaged by the tucking head. There can be no mechanical "miss" or damage caused by the tucking head due to the proper initial positioning of the flaps by the air blasts.

It should be apparent that the problem encountered in packaging apparatus of the exemplary type shown in the drawings concerns the inward tucking of the back flaps 18 and 18'. These flaps must be folded inwardly so that their free edge points in the general direction of movement of the package through the apparatus. In contrast, the flaps 20 and 20' must be folded inwardly so that their free ends are directed in a direction opposite to that of movement of the package through the apparatus. Tucking of the flaps 20 and 20' is easily achieved, and with the assembly of the present invention tucking of the flaps 18 and 18' is also easily achieved, notwithstanding the fact that with prior constructions, the tucking of the latter mentioned flaps cause substantial problem. Notwithstanding the fact that in the apparatus shown, satisfactory operation is achieved without using "air assist" on the flaps 20 and 20', in certain instances, as with a variation in machine or package, it can be desirable to "air assist" for all tucking operations. Accordingly, it is to be understood that the invention is not limited to "back dust flap" assist, but is shown and described in connection therewith since this operation heretofore caused the most serious problem.

Specific construction of preferred embodiment

The details of construction of the specific expedients incorporated in the assembly provided by the present invention may vary depending on the particular use, and particular machine in question. As explained below, various modifications can be made to the control means without departing from the scope and spirit of the invention. In fact, the invention provides for certain modifications.

Still, it has been found that the preferred valve construction to be incorporated in the assembly is that known as CRV Model 311, Roller Cam-three and four way, produced by Modernair Corporation, San Leandro, California.

Moreover, it has been found that the assembly is readily adapted to be installed on any automatic packaging mechanism of the type shown in the drawings. One of such types is known in the trade "Mara Pak H.U." In this device, as in other mechanisms of similar type, the conveyor is driven by or through a drive mechanism 7 having a horizontal output drive shaft 9 and a vertical output drive shaft 90, as shown in FIGURE 10. The horizontal output drive shaft is coupled directly with the conveyor drive, or with a sprocket 13 directly driving the conveyor. In accordance with the invention, a plate such as that designated by the numeral 100 can be directly coupled with the housing from which the vertical drive shaft 90 extends. As shown in FIGURES 1-3 the valves 68 and 70 are mounted on plate 100, and cam 92 comprising the cam lobes 94 and 96 is mounted on shaft 90. In this manner, the assembly provided by the present invention in effect constitutes an attachment for existing devices which attachment is adapted to be driven in synchronism with the conveyors thereof.

The particular form of nozzle 50 or 52 can vary, however, I have found that a right angled nipple-type fitting such as that designated by numeral 51 (FIGURE 28)

can be suitably coupled with a connecting block such as that designated by the numeral 60. The connecting block is provided with a passageway 61 therein extending between the inlet of the conduit 64. The coupling block is threaded, as conventional, to receive the fittings. It should be apparent that connecting block 62 which supports nozzle 52 corresponds to block 60, and thus detailed explanation thereof would merely be repetitious.

While the construction present in FIGURES 1 through 6, and explained in detail hereinabove, constitutes the preferred embodiment of the present invention, certain modifications can advantageously be made thereto, as explained in more detail hereinbelow.

Modification of FIGURE 7

In FIGURE 7, there is presented in the assembly of the present invention a single valve which operates to alternately control the supply of air to the nozzles 50 and 52 of the system of FIGURE 1. This single valve is generally designated by the numeral 200 and comprises a valve housing 202 and a rotatable distributing head 204 (FIGURE 8). Air is fed to the housing 202 via a supply line 206. With the distributing head 204 in the position shown, fluid passed through the conduit 206, travels through the passageway 210 in the distributor head 204 and out of conduit 64. When the distributing head 204 is rotated 90° counter-clockwise from the position shown, then the passageway 210 communicates the inlet conduit 206 with the outlet conduit 66.

When the valve of FIGURE 8 is utilized in the embodiment of FIGURE 7, then as the cam 215 comprising lobes 216, 217 attached to the shaft 90 rotates it causes the lever arm 222 to pivot back and forth about pivot connection 221. This movement results in moving the passageway 210 from a neutral point where it communicates with no inlet and no outlet, to a point where it communicates the inlet 206 with one of the outlets 64 or 66. The communication would be alternate with the respective outlets. By suitably disposing the cam lobes 216 and 217 in arcuately spaced relation, the desired sequential timing is achieved. In conventional manner lever arm 220 is spring biased to neutral position.

It will be noted that the construction of FIGURE 7 is essentially the same as the construction of FIGURES 1 through 6, and that the only modification thereof resides in the provision of a single valve, as opposed to the double valve construction shown in FIGURES 1 through 6.

Modification of FIGURES 9 through 11

In the foregoing discussion, it has been assumed that a cam type valve is included in the assembly provided by the present invention, and that such cam type valve includes a cam follower arm, and a cam activating such arm. The invention, however, is not limited to cam activated valve assemblies and the construction of FIGURES 9 through 11 provides for replacing the cam type control operation with an electrical switching control operation. More specifically, the switch arm 300 replaces the control cam 92 incorporated in the "assist assemblies" described above, and serves to provide for sequential operation.

Consider first FIGURE 10. In this figure, a right angle switch arm 300 is provided on the conveyor support frame 301, and this arm is pivoted about a shaft 302. The upper leg 304 of arm 300 is disposed in the path of a package 2 moving through the apparatus. As the package engages the upper leg 304, it is moved downwardly, thereby moving the lower leg 306 of arm 300 to the right as shown in FIGURE 10. In particular, the right angle switch arm 300 pivots about the axis 302 causing the lower leg 306 to move to the left.

The lower leg 306 cooperates with a micro-switch 310 having a reciprocal activating button 312 projecting to the left thereof. Downward movement of the leg 304

causes resulting movement of the leg 306 to the right, and as a result leg 306 presses inwardly on the activating button 312 and closes the micro-switch 310.

The micro-switch 310 is coupled in the line 318 whereby, upon closing, it serves to establish connection from a suitable supply of electric current (not shown) with the electrically operable valve means 320.

The valve means 320 may take any suitable form, whereby when the switch 310 is closed, the same is energized or activated so as to pass fluid from the supply conduit 206' to the outlet nozzle 50. With the particular construction shown in FIGURE 9, an electrically actuatable valve 320 would be provided at each station 6 and 8 (FIGURE 1) and similarly a pivotal arm 300 would be provided along the path of movement of the package 2 forward of each of the stations. With this assembly, the package itself serves to cause operation of the valves, which in turn would cause an air blast to pass against the back flaps 18 and 18' of the carton being operated upon.

It will be appreciated, that with this modification, as well as with the other modifications explained above and below, the valves are operated in time sequence to movement of the package through the apparatus by the conveying means 4.

Modification of FIGURES 12 through 16

The modification presented in FIGURES 12 through 16 is in certain respects similar to the modification of FIGURES 9 through 11. More particularly, a micro-switch 400 is used to control operation of the valve 320 which is electrically operable and corresponds exactly with the valve 320 of FIGURES 9 through 11. With the embodiment of FIGURES 12 through 15, however, the micro-switch is not placed in the path of movement of the package 2 so that the package pressure activates the switch. Instead, the side guide rail 36 of FIGURE 1 is modified, and appears as the guide rail 36' of FIGURE 13. Cooperating with the guide rail 36' is a finger member 402 comprising an enlarged end 404 and a finger member 406 adapted to pass through the slot 408 in the guide rail 36' when the enlarged end 404 is fastened by any suitable means to the head end 37 of guide rail 36'. The components are assembled as shown in FIGURE 12, and the micro-switch 400 is disposed directly behind the finger 406 so that the activating button 410 thereof is engageable by the finger 406.

With this construction, as a carton approaches the guide rail 36', the end flap 20 is folded inwardly as shown in FIGURE 12, and this folded-in end engages the finger 406 thereby pressing the same in the direction of arrow C. Movement of the finger 406 inwardly, or in the direction of arrows C, causes inward urging of the activating button 410 of micro-switch 400, and closing of the switch whereby the electrically actuated valve 320 is operated to pass air from the supply line 420 to the outlet nozzle 50. This operation is timed so that the air blast is directed onto the flap 18 or 18' immediately in advance of engagement of the flap 18 or 18' by the mechanical tucking head 38 or 39 respectively.

It will be appreciated that the finger 406 may be disposed in any suitable location along the guide rail 36' so that the proper sequential timed operation is obtained. It will also be appreciated that the sequential operation utilized to activate the valve at station 6 is essentially the same as that utilized to activate the valve on the other side, or at a station corresponding to station 8 of FIGURE 1.

In FIGURE 15, the finger 406 is shown in the position which it will assume when engaged by the carton 2, or more particularly the end of the carton 2 at which the flaps 18, 20 are disposed. Moreover, from FIGURE 15 the manner in which the mechanical tucking head 38 serves to bend inwardly the flap 18 is apparent.

FIGURE 16 shows the construction of FIGURES 12

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through 15 as the same would appear from the side. It will be noted that there is an opening 425 in the lower front portion of the guide rail 36'. This permits the mechanical tucking head 38 to pass under the portion of the guide rail extending forward of the rail head end 37. This construction is identical with the constructions of the other figures to which reference has been made hereinabove, as well as with the construction with reference to other figures described hereinbelow. In each instance, the guide rail is constructed with a head end and a forwardly extending finger portion under which the tucking head is free to pass.

Modification of FIGURES 17 and 18

The modification of FIGURES 17 and 18 provides for activating the valve distributing air to the outlet nozzles by means of the mechanical tucker itself. The mechanically actuated valve is designated by the numeral 500, and is shown as being coupled with the suitable inlet conduit 502 and provided with a nozzle 50. An actuating arm 504 extends from the valve 500 in the path of the mechanical tucking head 38.

As the mechanical tucking head approaches engagement with the flap 18', it engages arm 504 and moves the arm counterclockwise thereby opening the valve and allowing air to pass through the nozzle 50 to direct the flap 18 inwardly as shown in FIGURE 17. After the initial inward tucking operation, and as the head 38 engages the flap 18, as shown in FIGURE 18, and the valve is allowed to return to closed position under a suitable conventional spring bias or the like.

It will be understood that the mechanical tucking head and conveyor therefor presented in FIGURES 17 and 18, correspond identically with the similar components in FIGURES 1 through 6, as well as other figures of the drawing. Moreover, while the details of the valve itself have not been shown, it should be apparent that any suitable type valve may be used.

Modification of FIGURE 19

The modification of FIGURE 19 is in certain respects similar to the modification of FIGURES 9 through 11. However, with the modification of FIGURE 19, a separate support 600 is attached to the guide rail 36, and pivotally mounted on this support is a spring biased arm 602 normally urged for counterclockwise rotation. The arm 602 is pivoted about shaft 604 which carries a cam lobe 606 thereon. The cam lobe 606 is adapted to cooperate or urge inwardly the activating button 610 of a micro-switch 612.

The arm 602 extends across the path of the conveyor.

As the package approaches the mechanical tucker at station 6, an enlarged package supporting arm 612 engages the actuating arm 602 thereby causing closing of micro-switch 612 and operation of the valve 620 electrically coupled to switch 612. This results in passage of air from the nozzle 50 onto flap 18. The air in this instance, is supplied to the valve 620 by means of a suitable supply line 622.

The valve 620 is electrically operable just as the valve 320 of FIGURE 12 is electrically operable.

It will be appreciated that the arm 612 is moved by the upwardly projecting post 612 which preferably extends above other posts provided on the conveyor. The provision of extended posts 612 allows for properly placing the same on the conveyor to achieve desired sequential operation.

Modification of FIGURE 20

The modification of FIGURE 20 is similar to the modification of FIGURES 17 and 18, except that instead of using a mechanically actuatable valve, an electrically actuatable valve 700 is used. This valve is coupled for operation with the micro-switch 702, and this micro-switch, like others referred to above, is provided with a suitable activating button 704. The micro-switch is sup-

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ported on a suitable frame member (not shown) whereby the switch button extends in the path of movement of the mechanical tucking head 38 so that as the mechanical tucking head approaches a flap to be folded inwardly, the micro-switch is actuated, and in turn the valve 700, being electrically operated, is also actuated. This causes a blast of air to issue from the nozzle 50, which blast of air presses against the flap 18. The blast continues until the mechanical tucking head 38 disengages the activating button 704, at which time the mechanical tucking head engages the flap 18 thereby pressing the same into the desired position for ultimate complete closing by the guide rail 34.

Modification of FIGURES 21 through 23

In the "assist assembly" of FIGURES 21 through 23, instead of using a mechanical or switching type control for activation of the valve means, a photoelectric sensing system is provided. Such system includes the source of radiant energy generally designated by the numeral 800, and the photoelectric receiver generally designated by the numeral 802.

The source of radiant energy 800 which can comprise in accordance with conventional practice, a light and focusing lens, is adapted to transmit energy to the receiver 802 across the path of a package 2 moving through the apparatus. As shown in FIGURE 21, the photoelectric source is preferably disposed below the conveyor, and the receiver 802, which preferably comprises a photocell-relay circuit, is preferably disposed above the conveyor. As the package approaches the source of radiant energy, the receiver 802 is activated and this in turn activates the electrically operable valve 810.

In FIGURE 23, the suitable circuit connections for receiver 802 are shown. The receiver 802 comprises photocell 803 which is coupled with a suitable triode amplifier tube 804. When a package blocks the radiant energy from the photocell 803, a potential drop across the resistance 806 results. This changes the potential of the grid 808 of triode 804, thereby causing a change in current passing from the cathode 810 thereof to the plate 812 thereof. The change in current passing to the plate 812 results in a change in current through the relay coil 814, and in turn the relay which is schematically represented, is caused to close. This relay, which may be of any conventional form, is provided with switch contacts 811 and 813 coupled in circuit with the electrically operated valve 810.

With the provision of this conventional type of photoelectric sensing arrangement, operation of the valve means is controlled so as to allow for passage of air from the supply through the nozzle 50 at the desired time for proper sequential inward folding by the air blast and then the mechanical tucking head 38.

Modification of FIGURE 24

FIGURE 24 corresponds in many respects to the system shown in FIGURE 1. The difference lies in the fact that a single cam member 900 is provided on the shaft 90, and this single cam member 900 serves to operate a pair of microswitches 902 and 904 which are coupled in circuit respectively with the electrically actuatable valves 906 and 908 disposed at stations 6 and 8 respectively. In essence, the system of FIGURE 24 incorporates the desirable feature of electrically operated valves as used in the systems of FIGURES 9-11, 12-15, 19 and 20. The cam 900 is coupled on the shaft 90 in exactly the same manner as the cam 92 is coupled on the shaft 90 in the construction of FIGURES 1 through 6. Time sequential operation is achieved by mounting the same so as to activate the buttons 901 and 903 of micro-switches 902 and 904 respectively immediately in advance of the time when the mechanical tucking head 38 engages the flap 18. In this manner, air blasts are directed through the nozzles 50 and 52 at the desired times.

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The micro-switches 902 and 904 are, of course directly coupled in circuit with electrically actuatable valves 906 and 908. It should be apparent that one advantage of the system of FIGURE 1 over the system of FIGURE 24 is that the latter requires two switches and two valves, whereas the former requires only two valves. At the same time, the system of FIGURE 24 permits a smaller control assembly disposed immediately adjacent shaft 90.

Modification of FIGURE 25

The system of FIGURE 25 is similar to the system presented in FIGURES 7 and 8. A single valve is used to control supply of air from the source to the particular nozzle in question.

In the FIGURE 25 construction the valve comprises a housing 950 having a rotatable distributing head 952 therein. The supply is fed via conduit 954 which leads into the branch conduits 956 and 958 disposed 90 arcuate degrees apart. The valve distributor 952 is provided with a passageway 960 adapted to communicate the passageway 958 with the outlet conduit 962, or alternatively, adapted to communicate the inlet passageway 956 with the outlet passageway 964. As opposed to using a cam drive, a chain drive 970 is suitably coupled with a shaft projecting from the rotatable valve body 952, in any conventional manner, so as rotate the same.

It will be understood that with the modification of FIGURE 25, time sequential operation is achieved by rotating the head 952 at a suitable rate synchronized with movement of the package through the conveyor.

The particular manner in which the drive 970 causes rotation of the valve body 952 is shown as comprising a chain 972 passing about a sprocket 974 mounted on the shaft 976. The shaft projects from the bottom of the distributing head 952, and thus as the shaft rotates, the distributing head 952 rotates.

As opposed to using the drive construction of FIGURE 26, with the construction of FIGURE 25, the drive of FIGURE 27 may be used. In this instance, the valve operating drive chain 981 is provided with a projection such as that designated by the numeral 980, and the actuating shaft for the valve is provided with a geneva type wheel 982 carried on a shaft 984 coupled directly with the particular valve member to be moved. As the projecting lug 980 engages one leg of the geneva wheel 982, the same is caused to rotate counterclockwise. Thereafter, no substantial further rotation is caused until the next leg of the geneva wheel 982 is engaged by a similar projection 980.

Modification of FIGURES 29 through 36

In the preferred embodiment of the present invention, and the modified embodiments of the present invention discussed above, a nozzle means for directing fluid delivered thereto against the flap to push the flap inwardly is incorporated, and a control means for operating a valve means to pass fluid therethrough from a supply to the nozzle means as the package approaches and is at least initially engaged by the means for mechanically folding the flap inwardly, is also provided. The nozzle means is disposed immediately in advance of the means for mechanically folding in the path of the package moving through the apparatus. The modification presented in FIGURES 29 through 36 differs from the prior constructions of such type in certain respects, yet operates upon the same principles.

More particularly, in the embodiment of FIGURES 29 through 36 the nozzle means is incorporated in and forms part of the means for mechanically folding. Thus, as opposed to using a stationary nozzle means past which a flap to be folded inwardly moves, there is provided, in a sense, a movable nozzle means which directs air against a flap to be folded inwardly.

If reference is now made to FIGURES 29 through 36, it will be noted that the conveyor means 4 shown in

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these figures corresponds exactly with the conveyor means 4 shown in the figures to which attention has been directed previously. Such conveyor means is adapted to move a package 2 to the right as shown past a guide rail 34, which guide rail serves as means for maintaining a flap folded in a closed position. Support posts 16 are of course provided for maintaining the package supported on the conveyor 4, and a drive 15' is provided for operating the means for mechanically folding. The drive 15', corresponds with the drive 15 shown in the other figures and is linked with the conveyor drive in any suitable manner so as to move synchronously therewith.

As suggested above, instead of using a separate nozzle, and means for mechanically folding, the embodiment of FIGURES 29 through 36 incorporates a folding arm means generally designated by the numeral 1000, means generally designated by the numeral 1002 for supporting the folding arm means for pivotal movement into the path of a package moving through the apparatus whereby the folding head 1004 carried by the folding arm means 1000 can engage a flap such as that designated by the numeral 18. The folding head 1004 comprises a hook-shape member having a passageway extending there-through, which passageway terminates in an outlet 1006 facing packages moving through the apparatus. The passageway in the folding head 1004 communicates with an inlet 1008 therefor, and a hose 1010 couples the inlet 1008 with a suitable connecting block 1012 to which air under pressure is set from a suitable supply.

A valve actuating element generally designated by the numeral 1014 is provided. This element can comprise a micro-switch, or alternatively, a mechanically actuated valve. In either event, the valve actuating component has a follower arm 1016 projecting therefrom, which arm carries a cam follower 1018.

In addition to incorporating the folding arm means, the folding head, the valve means, and the hose connection, as prescribed above, the embodiment of FIGURES 29 through 36 also includes a cam member 1020 having a cam follower groove 1022 therein, and having a cam surface 1024 defining the periphery thereof.

The means 1020 for supporting the arm 1000 for pivotal movement, as described, comprises a bracket 1030 which is fixed in the position shown by any suitable support. The arm means 1000 has depending therefrom a cam follower roller 1032 which extends within and cooperates with the cam follower groove 1022. Just as the roller 1032 cooperates with the groove 1022, the roller 1018 carried by the actuating arm 1016, cooperates with the periphery 1024 of the cam member.

To facilitate an understanding of the manner in which the various cam followers serve to move their associated components, attention is specifically directed to FIGURES 33 through 36. FIGURE 33 shows the actuating assembly with the cooperating components disposed in the position which they would occupy when the arm 1000 is in the position shown in FIGURE 29. The actuating arm 1016 of the valve means 1014 is depressed, and in this position, with this embodiment, serves to cut-off the air supply to the passageway in the folding head 1004.

Now, as the cam means or member rotates counterclockwise, to the position shown in FIGURE 34, the actuating arm 1016 moves to the right, or outwardly thereby opening the valve means or valve element 1014 and allowing air to pass to the folding head 1004. Accordingly, as shown in FIGURE 30, an air blast issues from the outlet 1006, which blast is directed toward the flap 18 and causes the same to be initially folded partially inwardly.

Further continued counterclockwise movement of the cam member allows the valve to remain open so that air passes through the hose 1010, and as a result the air blast continues as shown in FIGURE 31. However, with still further counterclockwise rotation of the cam member, it ultimately reaches the position shown in FIGURE 36,

whereupon the actuating arm 1016 is moved back to its initial position thereby closing the valve and cutting off the air blast. At this time, the folding head 1004 engages the partially inward folded flap 18 so that the same is in position for proper engagement by the guide rail 34 as shown in FIGURE 32. Continued rotation in the counterclockwise direction of the cam member causes the follower 1032 depending from the folding arm to travel through the arcuate groove section 1022b of the cam member. It will be noted that during the folding operation, the cam follower 1032 moves through the straight section 1022a of the cam member or of the groove 1022 therein. This straight section is disposed parallel to a diameter of the cam, but slightly off set from the center thereof. The arcuate section, to achieve the above operations, extends semi-circularly about one-half of the cam member, and then inwardly and arcuately joins smoothly the inner end of the straight section 1022a.

The outer periphery of the cam member namely surface 1024 is generally circular, but is provided with the inwardly off-set section 1024a so as to achieve proper movement of the valve actuating arm 1016. The inwardly off-set section 1024a is made concave at either end thereof, and convex in the central portion thereof so as to allow for smooth movement of the roller 1018 thereover.

After considering the foregoing description of the embodiments of FIGURES 29 through 36, it should be apparent that the ultimate operation thereof is essentially the same as the operation of the other embodiments of the invention considered hereinbefore. It should also be apparent that one of the advantages of this embodiment lies in the fact that the air blast moves closer to the flap to be folded inwardly as the same is to be engaged by a mechanical folding element. At the same time, this embodiment may prove slightly more expensive in manufacture due to the necessity of providing a specially conduit cam for operation. Of course, the cam may take other forms than that shown, and the manner in which the valve means is actuated may vary depending on the particularly operation. Since electrically actuated valve means have been discussed hereinabove, as well as mechanically actuated valve means, it is not believed necessary to further repeat the operation. The only difference required with the embodiment of FIGURES 29 through 36 is that the valve control disestablish communication with the nozzle when moved inwardly, and establish communication only when moved outwardly. Various types of conventional actuating means are known which operate in either manner, and the manner in which to construct the embodiment of FIGURES 29 through 36 therefore follows the same pattern as with other embodiments.

Of course, it will be appreciated that the embodiment of FIGURES 29 through 36 can be provided on opposite sides of a conveyor so as to tuck-in both of the rear dust flaps if required. However, since operation on both sides has been described above, and since operation on one side corresponds almost identically with operation on the other side, dual operation has not been shown in connection with the embodiments of FIGURES 29 through 36.

Modification of FIGURES 37 and 38

In connection with FIGURES 9 through 11, there was described herein above an electrical switching control operation which provided for sequential energization or activation of the air assist assemblies provided in accordance with the instant invention. The modification of FIGURES 37 and 38 is quite similar to the modification discussed in connection with FIGURES 9 through 11 and accordingly, where applicable, corresponding numerals are used.

The difference between the modification of FIGURES 37 and 38 and the modification of FIGURES 9 through 11 lies in the different disposition of the switching means and activating arm therefor. More particularly, in the modification of FIGURES 9 through 11, the microswitch

310 was shown as supported below the conveyor drive and an activating arm 300 was shown as supported in the path of a package being conveyed through the apparatus. In the modification of FIGURES 37 and 38 the microswitch which is designated by numeral 310' is supported above the conveyor 4 but still in the path of a package being conveyed through the apparatus. To provide for proper support of the microswitch a bracket 1300 is fastened to the guide rail 34 by means of rivets 1302, or by some other suitable attaching means. The bracket 1300 includes the upstanding leg 1304, the inwardly extending projection 1306 and the lateral support arm 1308 extending parallel to the guide rail 34. The microswitch 310' is carried on the laterally extending arm 1308 and a rocker arm 1310 is pivotally supported thereon. The rocker arm includes an upper head portion 1312 adapted to press inwardly against the switch activating button 1311 when the lower and weighted head portion 1314 is raised as a package presses through the apparatus.

The general operation is the same as with the embodiment of FIGURES 9 through 11, and thus specific reference to the detailed operation would merely be repetitive. Of course, it will be understood that FIGURES 37 and 38 only present one tucking station and that a double station system can be provided, as in the case of other embodiments, by duplicating the station of FIGURE 37 on the opposite side of the conveyor as discussed hereinabove.

Conclusion

During the preceding description of the various embodiments of the "assist assemblies" provided in the present invention for aiding inward folding or tucking of carton flaps, reference has been made to the disposition of certain components without explicitly reciting the manner in which the same are supported. Accordingly, it is to be understood that all of such components are supported in any suitable manner on the frame of the apparatus, or suitable brackets attached thereto.

A particular feature of the invention, however, provides for utilizing a plate member such as that designated by the numeral 100 in FIGURES 1 through 3 and 18 which is directly coupled with the drive housing of the apparatus, or "coder drive" housing as it is sometimes called in the trade, in those embodiments of the invention wherein a cam means driven synchronously with the drive means cooperates with a valve actuating follower arm or switch. The provision of the plate member which may be directly coupled with such housing, and the provision thereon of the components cooperating with the cam driven by the apparatus drive means facilitates installation of the assemblies provided by the instant invention on existing apparatus.

In the various figures of the drawing, the folding stations 6 and 8 have been shown as being disposed in laterally spaced relation whereby the flap at one end of the package was first folded inwardly, and then flaps at the other end of the package are folded inwardly. Although this disposition of the stations is preferred, and proved satisfactory in many operations, the invention may be utilized in apparatus wherein flaps at both ends of a carton are simultaneously folded inwardly without departing from the scope and spirit of the invention.

Similarly, while chain drives such as those designated by numerals 15 and 15' have been shown for purposes of driving the mechanical tucking expedients, and while the mechanical tucking expedients have been shown as comprising tucker conveyors having tucking heads thereon, the invention is not limited in application to apparatus incorporating such particular mechanical expedients.

Notwithstanding the foregoing, the preferred arrangement provided by the instant invention for driving the conveyor chains 36 and 37 carrying the mechanical tucking heads 38 and 39 respectively is presented in FIGURE 39. By referring to this figure it will be noted that

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the respective tucking stations 6 and 8 are driven directly with the coder drive housing 7. More particularly, shaft 1400 extends to the coder housing from station 6 and shaft 1402 extends from the coder housing to the station 8.

The shaft 1400 is driven through a conventional beveled gear arrangement 1404 shown in FIGURE 40. The system drive shaft 1406 enters the gear housing 1410 provided at station 6 and through the conventional beveled gear arrangement 1404, and causes rotation of the shaft 1400. In turn, the shaft 1400 enters the coder drive housing 7 and through the standard beveled gear arrangement 1412 drives the shaft 1402 extending laterally across the conveyor and therebelow to the station 8. Of course, a shaft 1416 extends vertically from housing 1410 to drive a suitable sprocket about which the conveyor chain 36 passes, and a similarly suitable shaft is coupled through the conventional gearing with the shaft 1402 so as to drive a sprocket engaged by the conveyor chain 37 at station 8.

Although the drive arrangement of FIGURES 39 and 40 is preferred it should be understood that various forms of drive can be used without departing from the scope and spirit of the invention. At the same time, an important feature of the present invention is the provision of an "assist assembly" which is readily adapted for use in apparatus utilizing the aforesaid types of drive expedients.

The plate 60 disposed at station 6 which carries the nozzle 50 has been shown as set back from the forward edge of the cover 40, i.e. from the edge of such cover extending parallel to the conveyor 4. The offset relationship can be utilized, and is presented in the drawings for purposes of convenience. However, it has been found that in certain instances more satisfactory results can be obtained if such plate is disposed in juxtaposition to the forward edge of the cover, i.e. if such plate is disposed in the same position as plate 62 as shown.

In the portion of the foregoing description which refers to FIGURE 28, attention has been directed to the fact that threaded nipple type couplings are preferably used for connecting the nozzle with the supply line, and for connecting a fluid or air conduit therewith. These same type of couplings are preferably used for connecting the various fluid conduits with the valve assemblies, as well as with one another in instances where necessary.

Notwithstanding such preferable arrangement, it will be understood by those of ordinary skill in the art that any suitable connections may be used without departing from the scope and spirit of the invention.

After reading the foregoing detailed description of the illustrative and preferred embodiments of the invention shown in the annexed drawings, and explained hereinabove, it will be noted that the objects set forth at the outset of this specification have been successfully achieved. Modifications other than those specifically set forth above may become apparent to those skilled in the art after reading the foregoing description, and accordingly, what is claimed is:

1. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination of nozzle means for directing fluid delivered thereto against said flap to push said flap inwardly, supply means for delivering fluid under pressure to said nozzle means, valve means connecting said nozzle means with said supply means, and control means for operating said valve means to pass fluid therethrough from said supply means to said nozzle means as the package approaches and is at least initially engaged by said means for mechanically folding the flap inwardly.

2. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding

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the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 1 wherein said valve means is cam actuated, and wherein said control means includes cam means, and means for driving said cam means synchronously with movement of packages through said apparatus.

3. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 2 wherein said valve means comprises a valve assembly having a mechanical actuating cam follower arm extending therefrom, and wherein said cam means includes a cam engaged by said cam follower arm.

4. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 1 wherein said valve means comprises an electrically actuated valve and switching means operatively coupled to said valve, said switching means having a cam follower operating arm, and wherein said cam means includes a cam engaged by said cam follower arm.

5. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 1 wherein said valve means is electrically actuatable, and wherein said control means includes photoelectric means for sensing package position, and switching means responsive to said photoelectric means for actuating said valve means.

6. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 1 wherein said valve means is electrically actuatable, and wherein said control means includes switching means operated by the package for actuating said valve means.

7. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination defined in claim 1 wherein said control means is activated by said means for mechanically folding.

8. In a packaging apparatus adapted to close carton flaps and including means for mechanically folding a flap inwardly, conveyor means for moving a carton past the means for mechanically folding the flap, and means for driving said conveyor, the improvement comprising the combination of activatable means for directing air against a carton to start folding of the same inwardly, said activatable means having an outlet disposed immediately in advance of said means for mechanically folding in the path of movement of a carton in said apparatus, and means driven by said drive means for activating said means for directing air as a carton flap approaches said means for mechanically folding whereby a flap is initially folded partially inward by air before being mechanically engaged by said means for mechanically folding.

9. In a packaging apparatus adapted to close carton

flaps and including means for mechanically folding a flap inwardly, conveyor means for moving a carton past the means for mechanically folding the flap, and means for driving said conveyor, the improvement comprising the combination defined in claim 8 wherein said activatable means for directing air comprises a nozzle defining said outlet, supply means for delivering air under pressure to said nozzle, and cam actuated valve means connecting said nozzle to said supply, and wherein said means driven by said drive means includes a rotating cam operatively coupled to said valve means.

10. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement comprising the combination of nozzle means for directing fluid delivered thereto against flaps moving therepast to push the flaps inwardly, supply means for delivering fluid under pressure to said nozzle means, valve means connecting said nozzle means with said supply means, and control means for operating said valve means to pass fluid therethrough from said supply means to said nozzle means, as flaps, to be folded inwardly so that the free ends thereof point in at least the general direction of movement of the package being conveyed, approach and are at least initially engaged by said means for mechanically folding.

11. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement comprising the combination defined in claim 10 wherein said nozzle means comprises a pair of nozzles disposed on opposite sides of said conveyor means; and wherein said control means comprises a rotating cam, means for driving said cam synchronously with said drive means, and means cooperating with said cam for sequentially operating said valve means.

12. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement comprising the combination defined in claim 11 wherein said valve means is electrically activatable and wherein said means cooperating with said cam comprises micro-switch means.

13. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement comprising the combination defined in claim 11 wherein said means cooperating with said cam comprises at least one cam follower activating arm mechanically coupled to said valve means.

14. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for mov-

ing cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement defined in claim 10 wherein said control means comprises a movable arm supported in the path of movement of a carton for engagement thereby, and switching means operated upon movement of said arm, and wherein said valve means is electrically actuable and coupled in circuit with said switching means.

15. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement defined in claim 10 wherein said nozzle means is disposed adjacent the folding members movable into and out of engagement with flaps.

16. In a packaging machine adapted to automatically close hinged flaps initially outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement defined in claim 15 wherein said drive means includes an output drive shaft and wherein said control means comprises a plate mounted on said drive means about said drive shaft, valve actuating means supported on said plate, and means rotatable with said shaft and cooperating with said valve actuating means for operation thereof.

17. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement defined in claim 16 wherein said valve means is also supported on said plate, wherein said valve actuating means includes cam follower operating arms, wherein said means rotatable with said shaft comprises a cam member cooperating with said follower arms.

18. In a packaging machine adapted to automatically close hinged flaps initially extending outwardly of a carton and comprising means for mechanically folding flaps inwardly including folding members movable into and out of engagement with flaps, conveyor means for moving cartons past said movable folding members, and drive means for synchronizing movement of said conveyor means with movement of said folding members, the improvement defined in claim 16 wherein said valve actuating means comprising micro-switch means, and wherein said valve means is electrically operable and disposed adjacent said nozzle means.

19. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, and including a guide rail for maintaining folded flaps in closed position, the improvement comprising the combination of nozzle means for directing fluid delivered thereto against said flap to push said flap inwardly, supply means for delivering fluid under pressure to said nozzle means, valve means connecting said nozzle means with said supply means, and control means for operating said valve means to pass fluid therethrough from said supply means to said nozzle means as the package ap-

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proaches and is at least initially engaged by said means for mechanically folding the flap inwardly.

20. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, and including a guide rail for maintaining folded flaps in closed position, the improvement defined in claim 19 wherein said control means comprises a movable arm extending through said guide rail in the path of movement of a carton for engagement thereby, and switching means operated upon movement of said arm, and wherein said valve means is electrically actuatable and coupled in circuit with said switching means.

21. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combination of nozzle means for directing fluid delivered thereto against said flap to push said flap inwardly, said nozzle means forming part of said means for mechanically folding, supply means for delivering fluid under pressure to said nozzle means, valve means connecting said nozzle means with said supply means, and control means for operating said valve means to pass fluid therethrough from said supply means to said nozzle means as the package approaches and is at least initially engaged by said means for mechanically folding the flap inwardly.

22. In a packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap hinged thereon past means for mechanically folding the flap inwardly so that the free end thereof points in at least the general direction of movement of the package being conveyed, the improvement comprising the combina-

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tion defined in claim 21 wherein said nozzle means comprises a folding head having a passageway therein.

23. In an automatic packaging apparatus of the type adapted to convey packages having at least one outwardly projecting flap thereon through the apparatus past means for maintaining a folded flap in a closed position, the improvement comprising the combination of folding arm means, means supporting said folding arm means for pivotal movement into the path of a package moving through said apparatus to engage a package flap, a folding head carried by said folding arm means and having a passageway therein terminating in an outlet facing packages moving through said apparatus, supply means for delivering fluid under pressure to said passageway, valve means coupled between said supply means and said passageway, said valve means including an actuating member engageable by said folding arm means, and means driven synchronously with movement of packages through said apparatus for moving said arm means into said path and thereby activating said valve means as said arm means moves into said path whereby fluid is directed against a flap immediately in advance of engagement thereof by said folding head.

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