

June 30, 1953

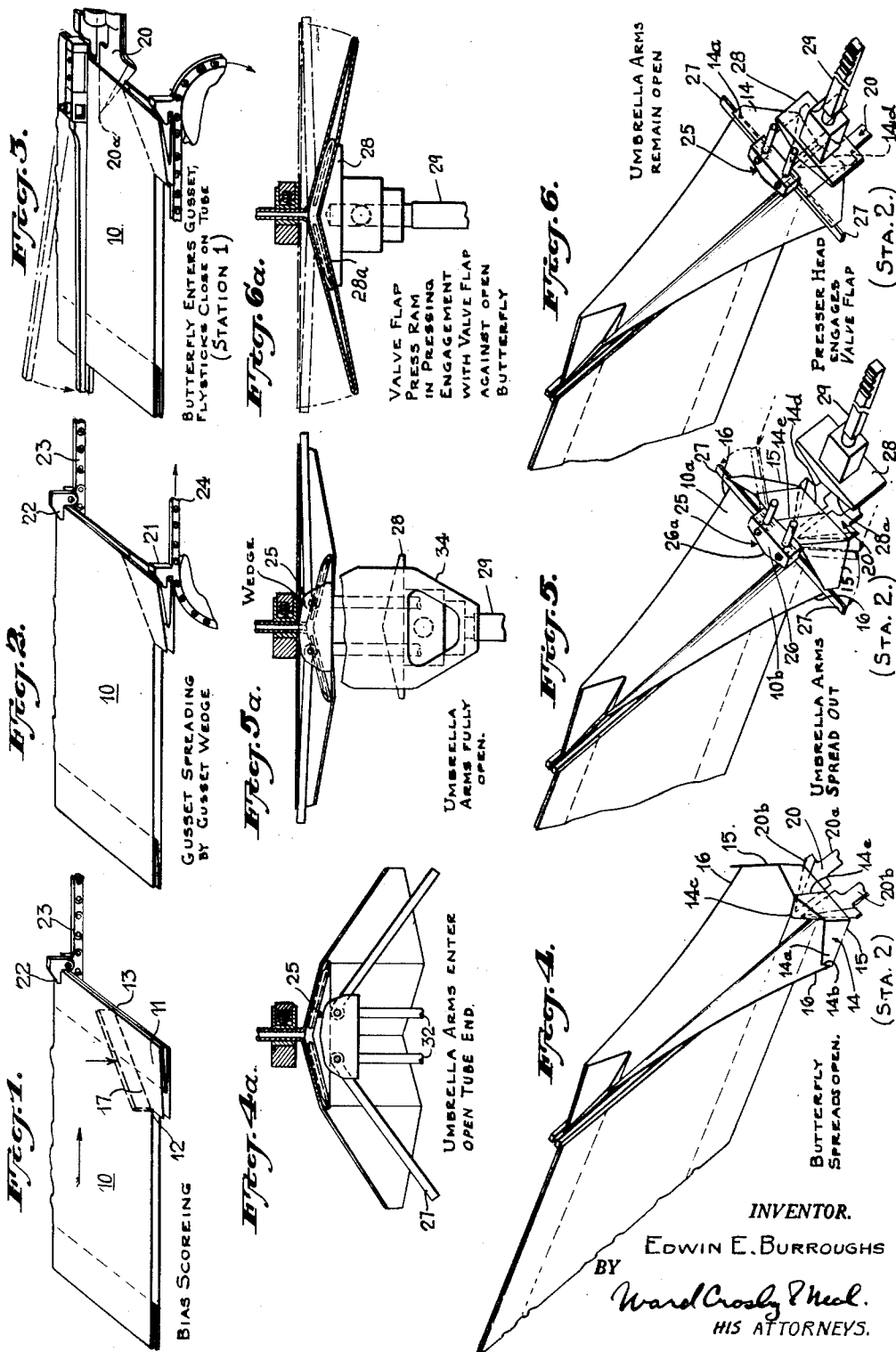
E. E. BURROUGHS

2,643,588

MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

Filed Sept. 29, 1949

18 Sheets-Sheet 1



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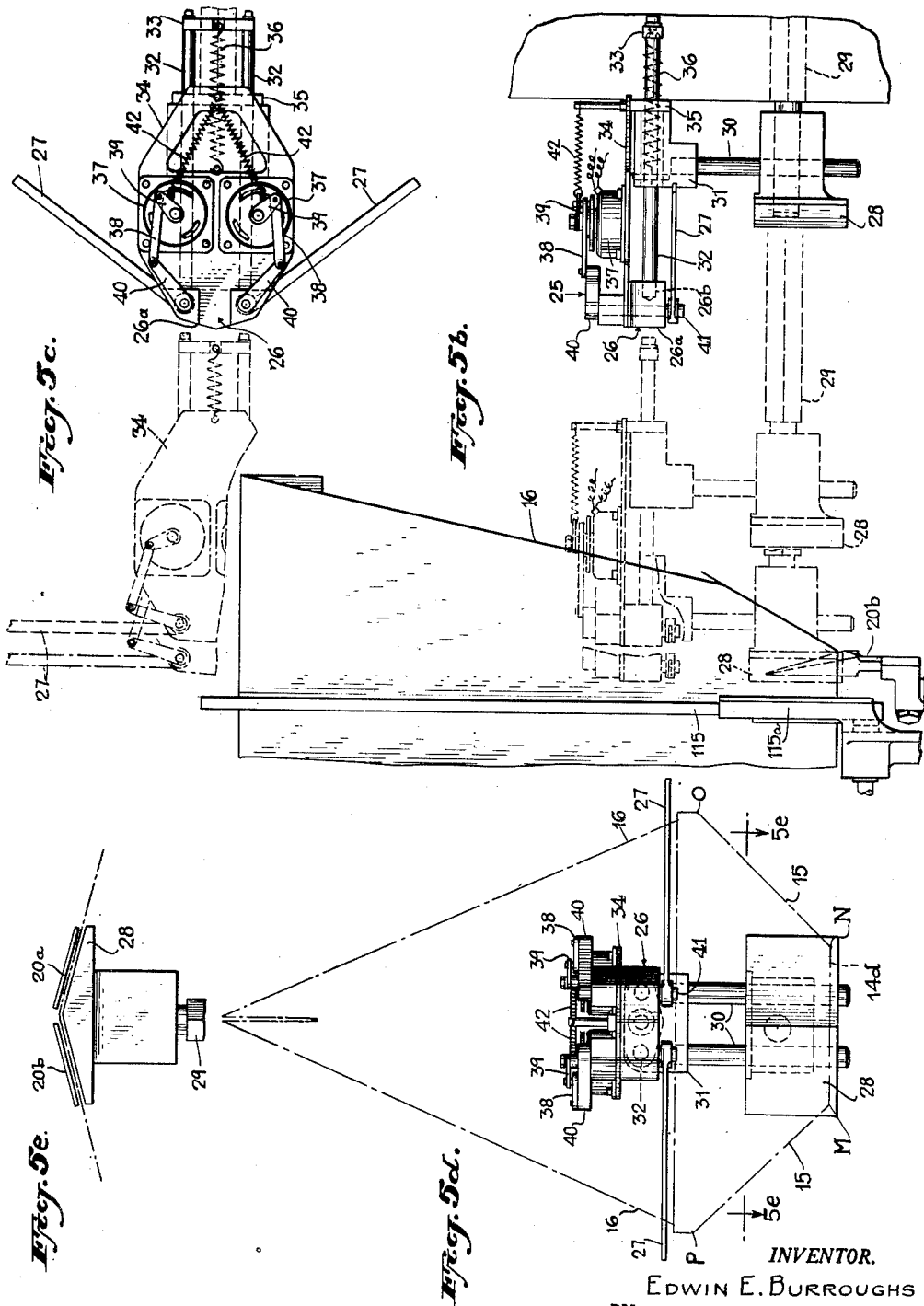
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18 Sheets-Sheet 2



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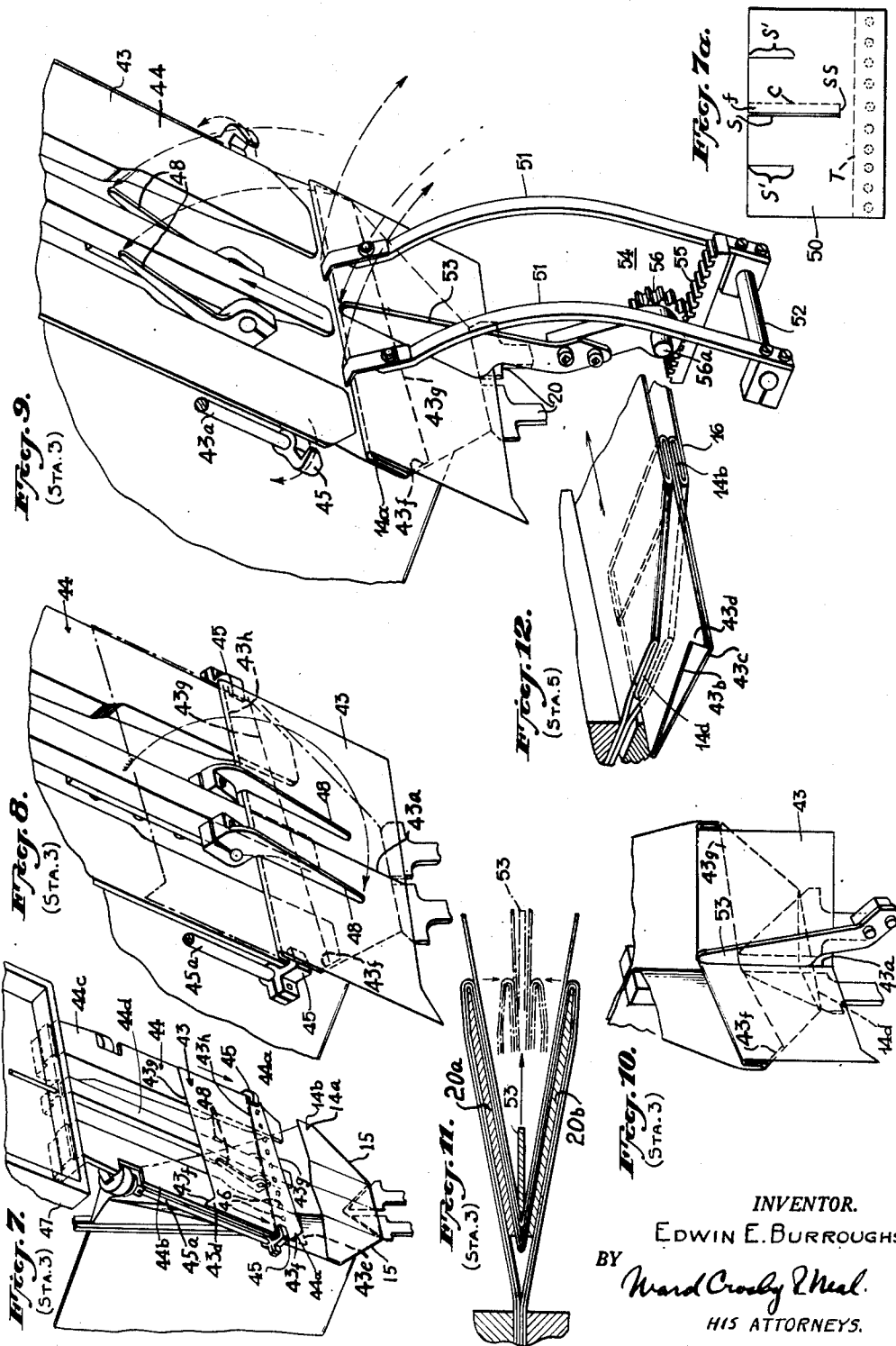
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18 Sheets-Sheet 3



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Fig. 13.

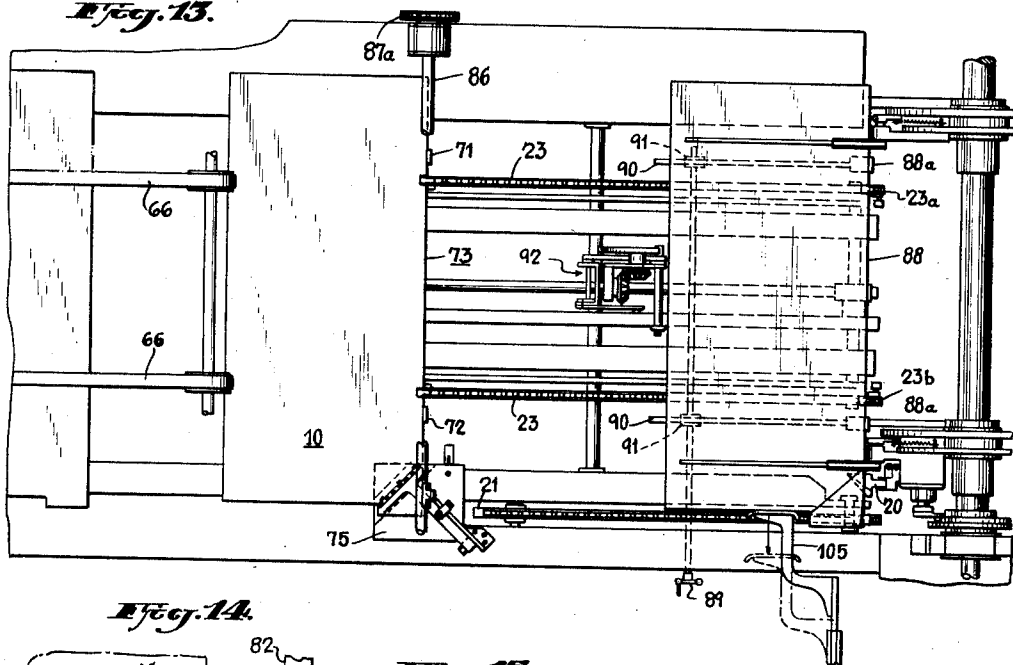


Fig. 14.

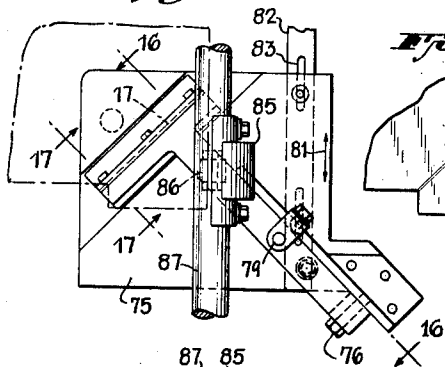


Fig. 15.

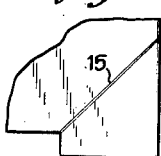


Fig. 19.

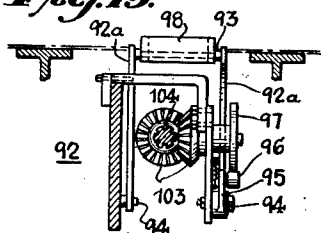


Fig. 18.

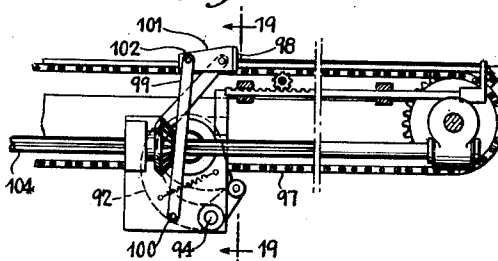


Fig. 16.

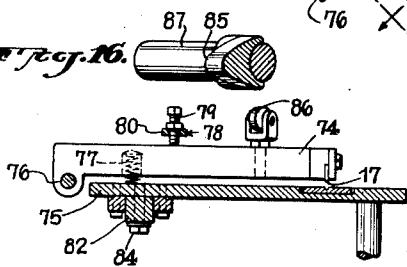
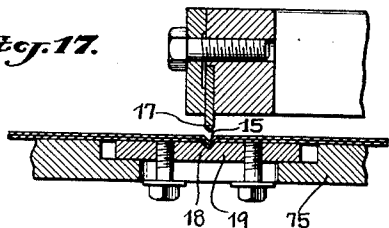


Fig. 17.



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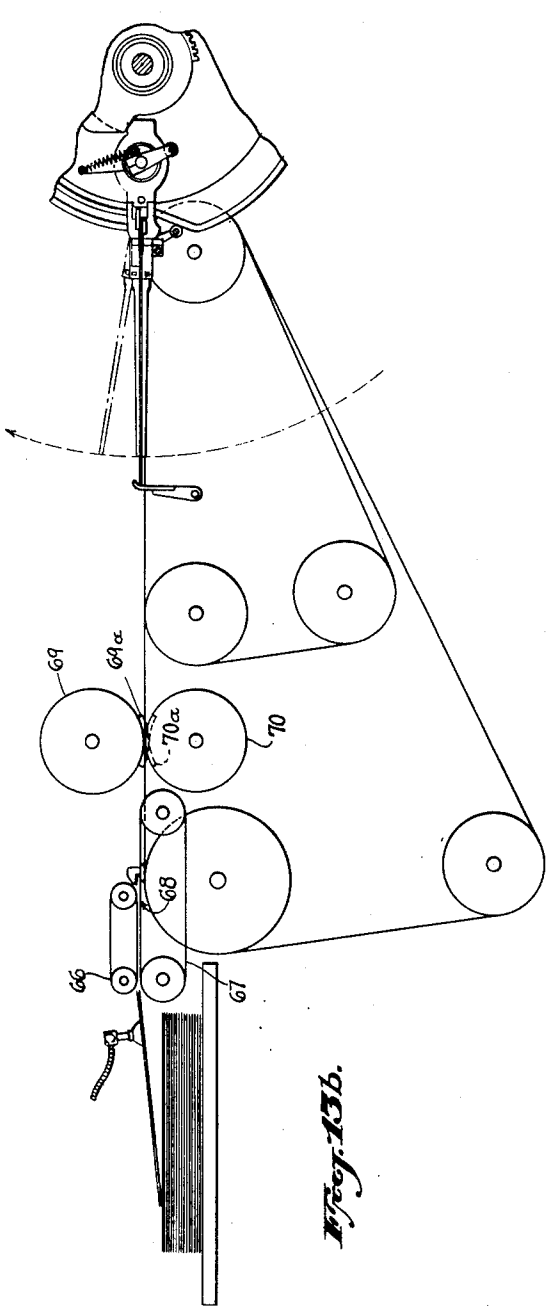
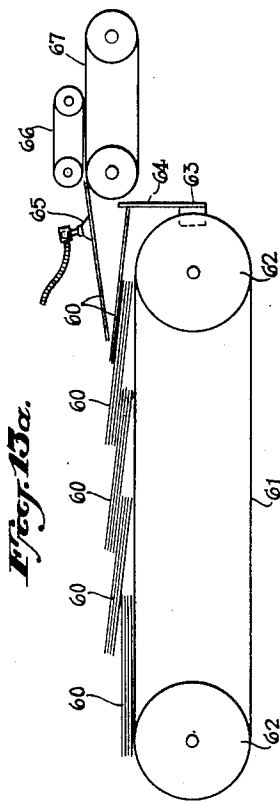
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18 Sheets-Sheet 5



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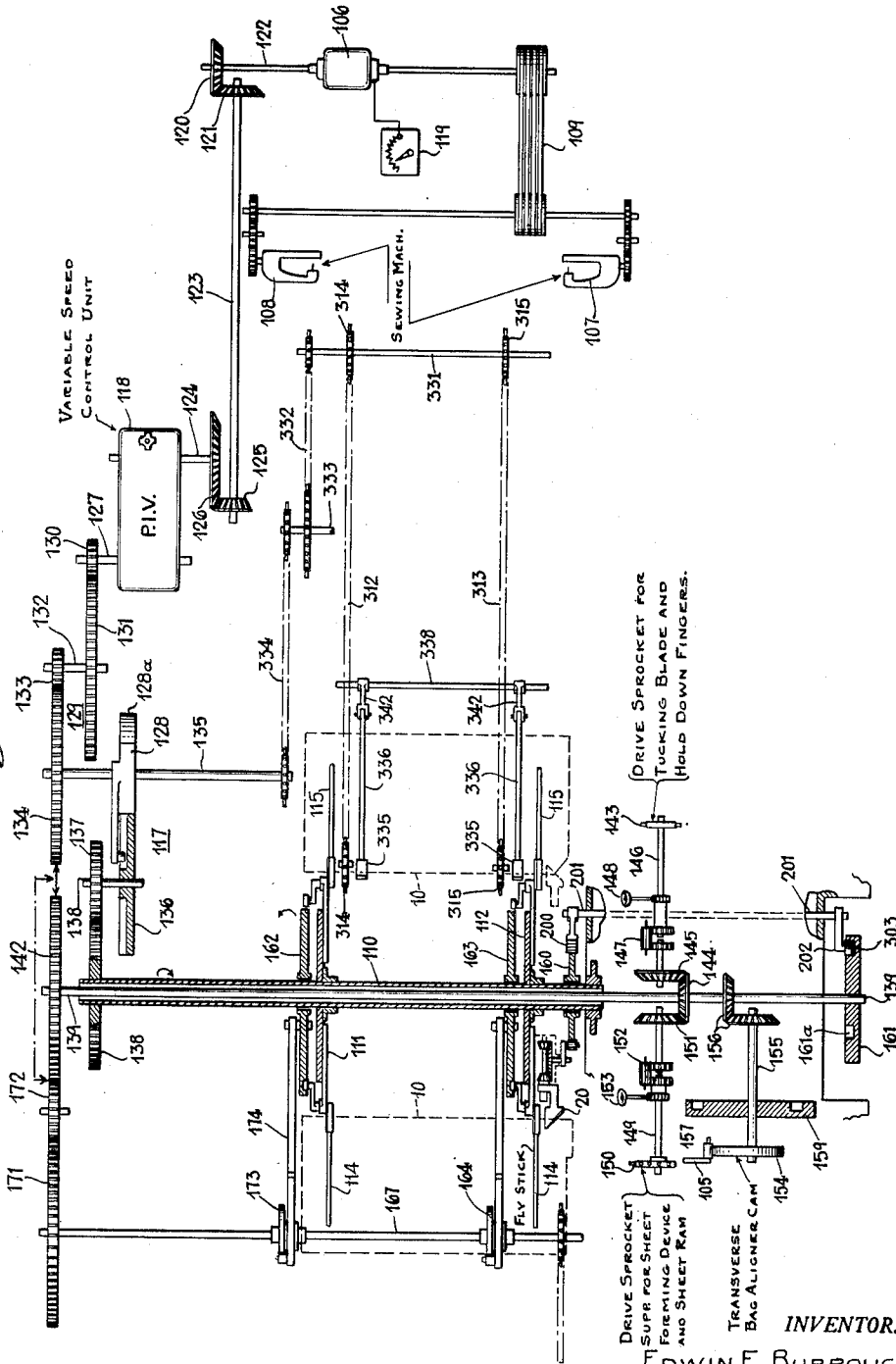
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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Fig. 20.



DRIVE SPROCKET FOR
TUCKING BLADE AND
HOLD DOWN FINGERS.

DRIVE SPROCKET
FOR SHEET
FORMING DEVICE
AND SHEET RAM

TRANSVERSE
BAG ALIGNER CAM

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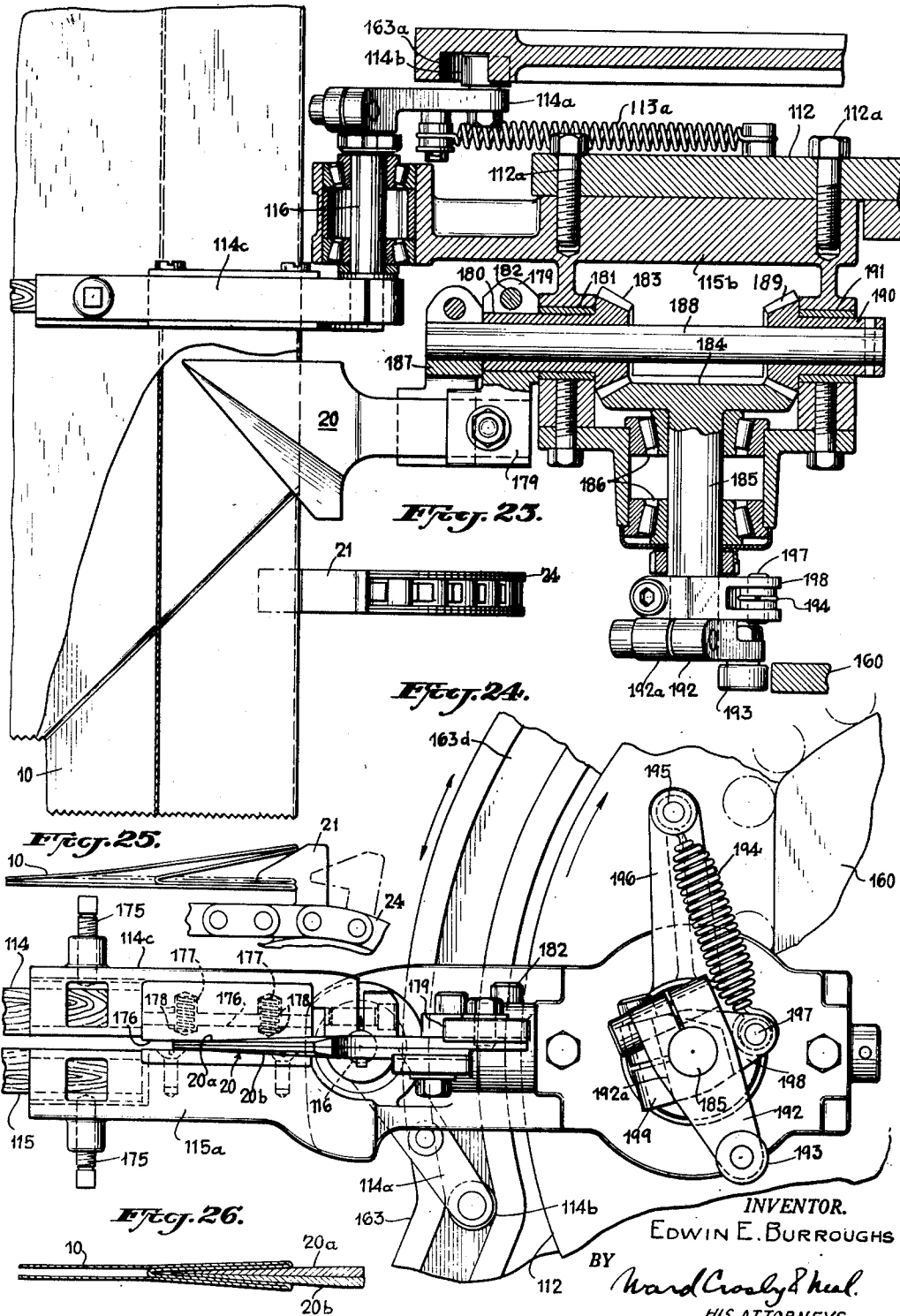
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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18 Sheets-Sheet 8



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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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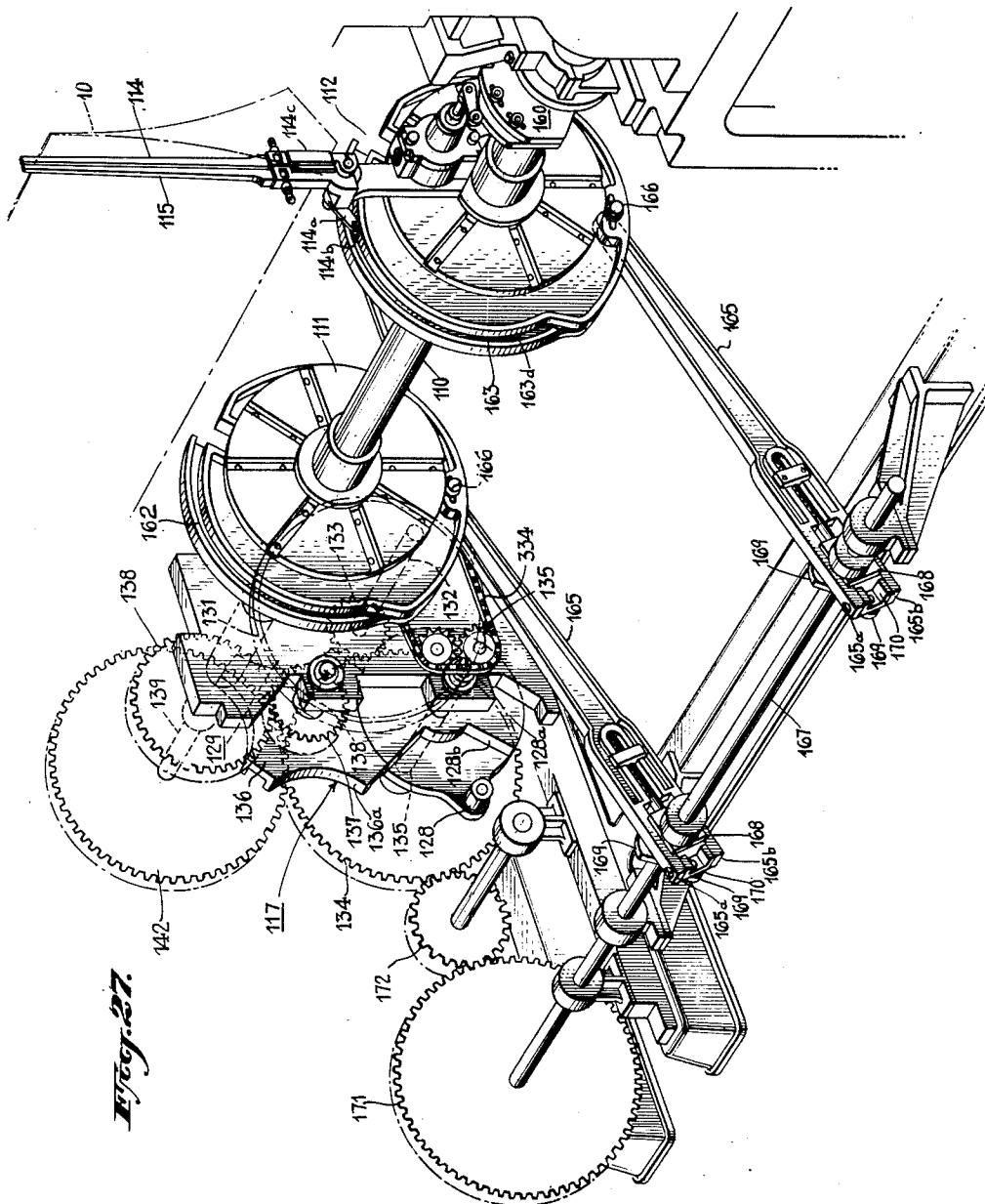


Fig. 27.

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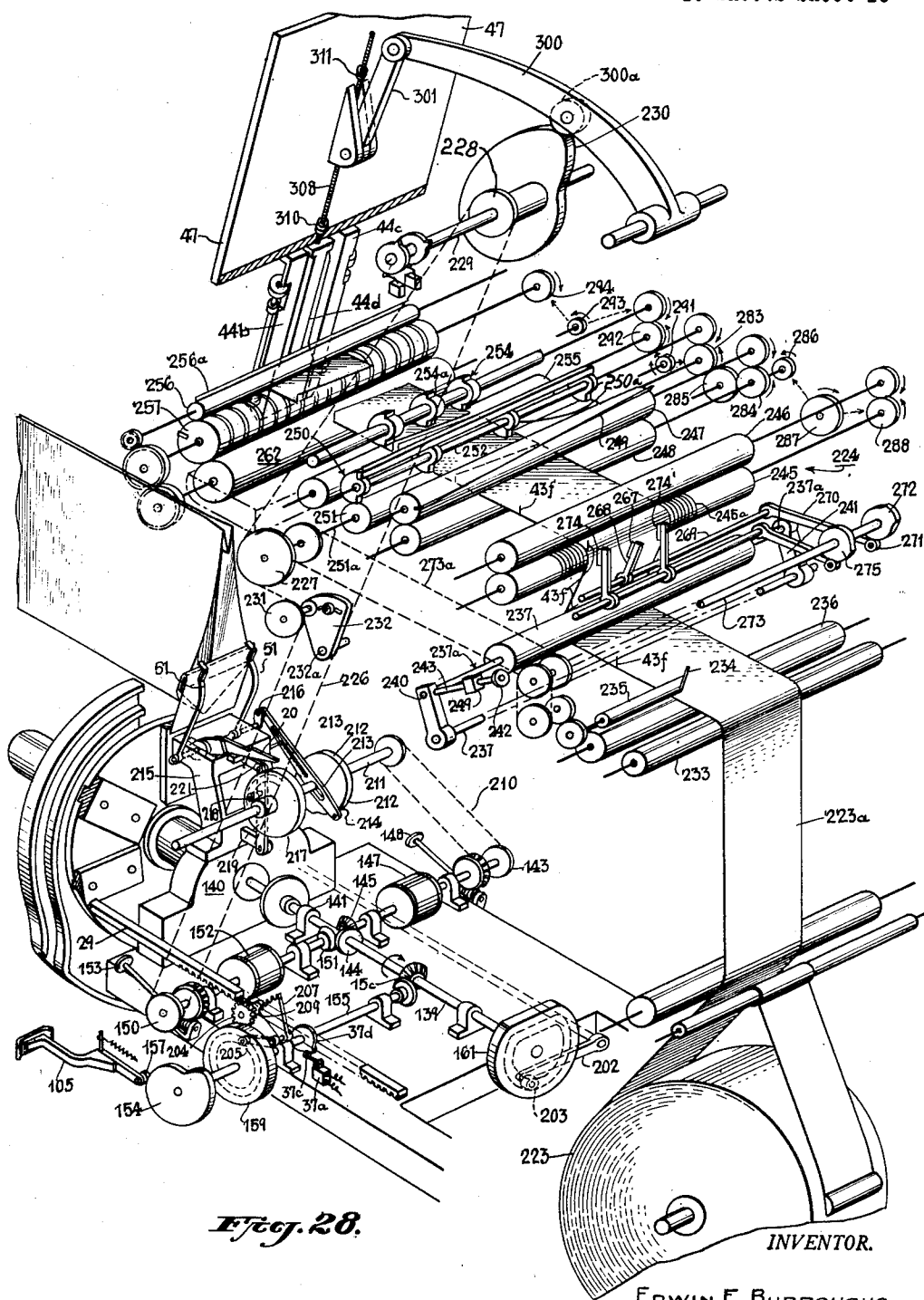
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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18 Sheets-Sheet 10



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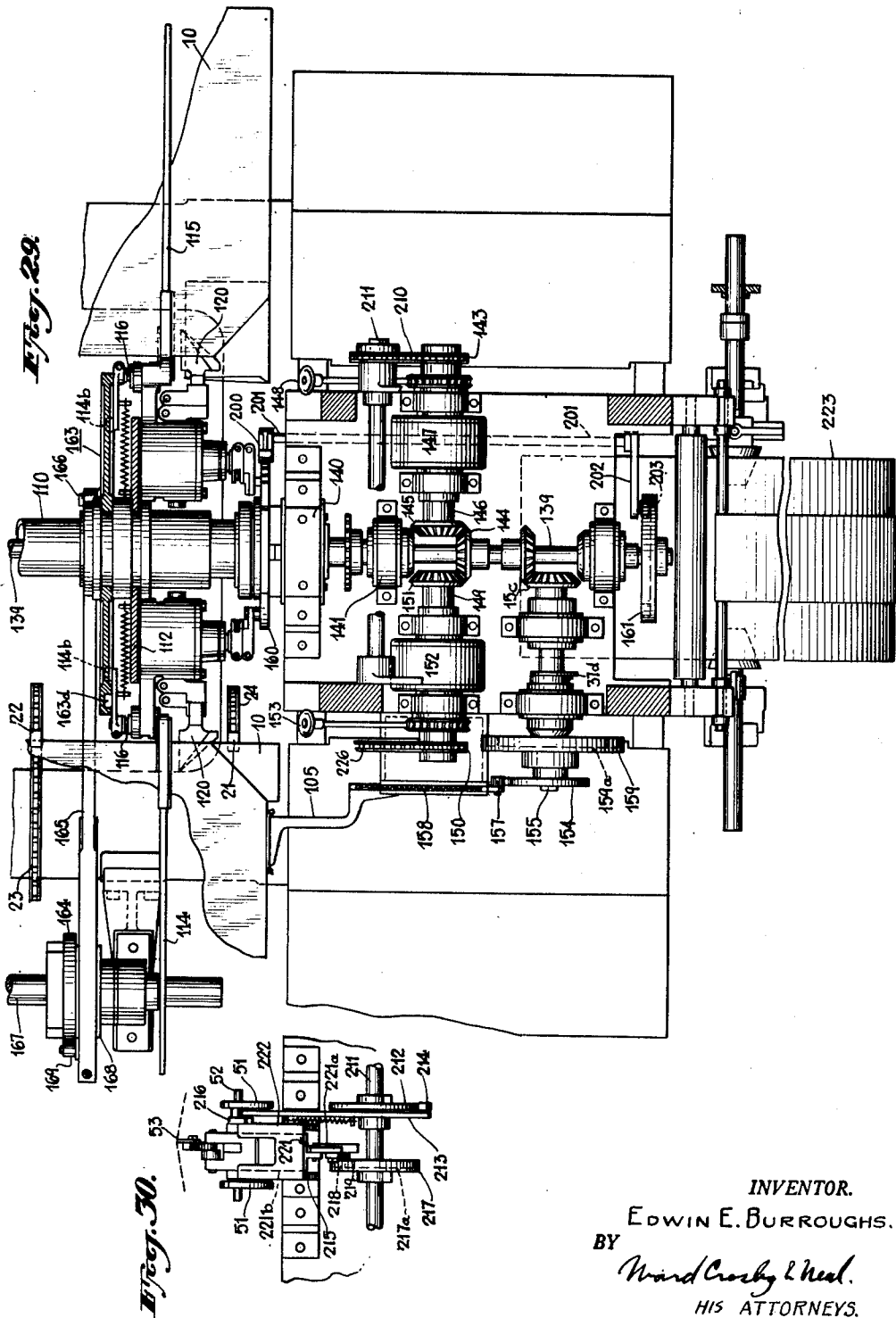
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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18 Sheets-Sheet 11



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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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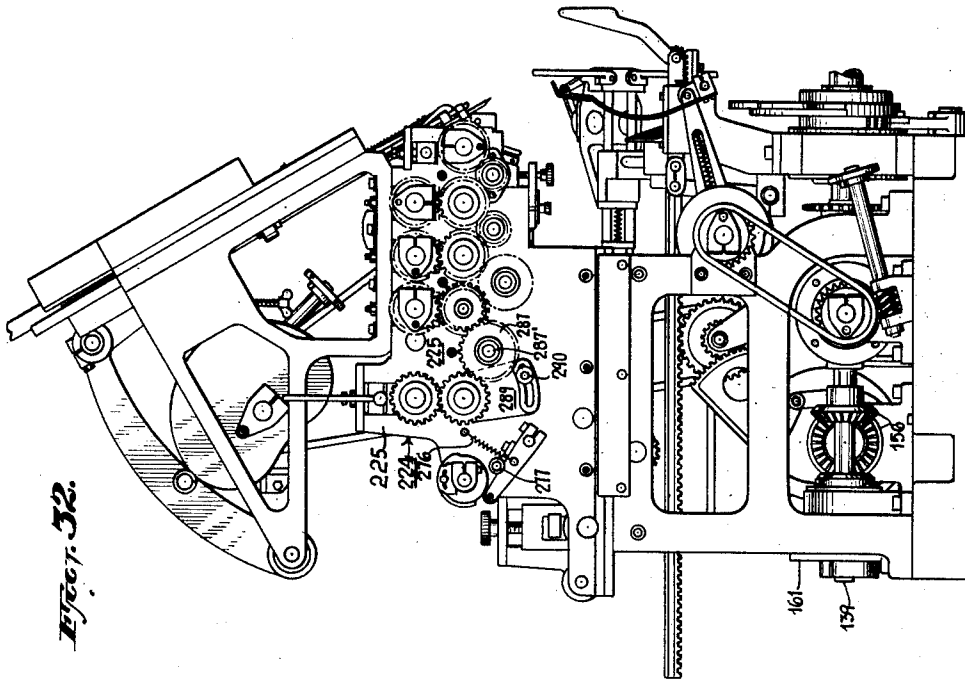


Fig. 32.

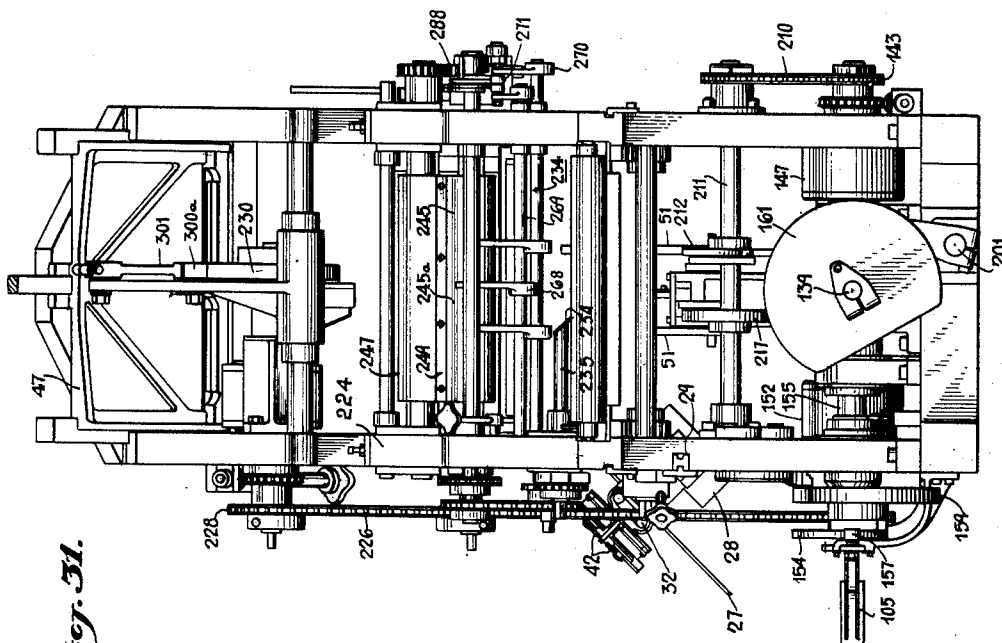


Fig. 31.

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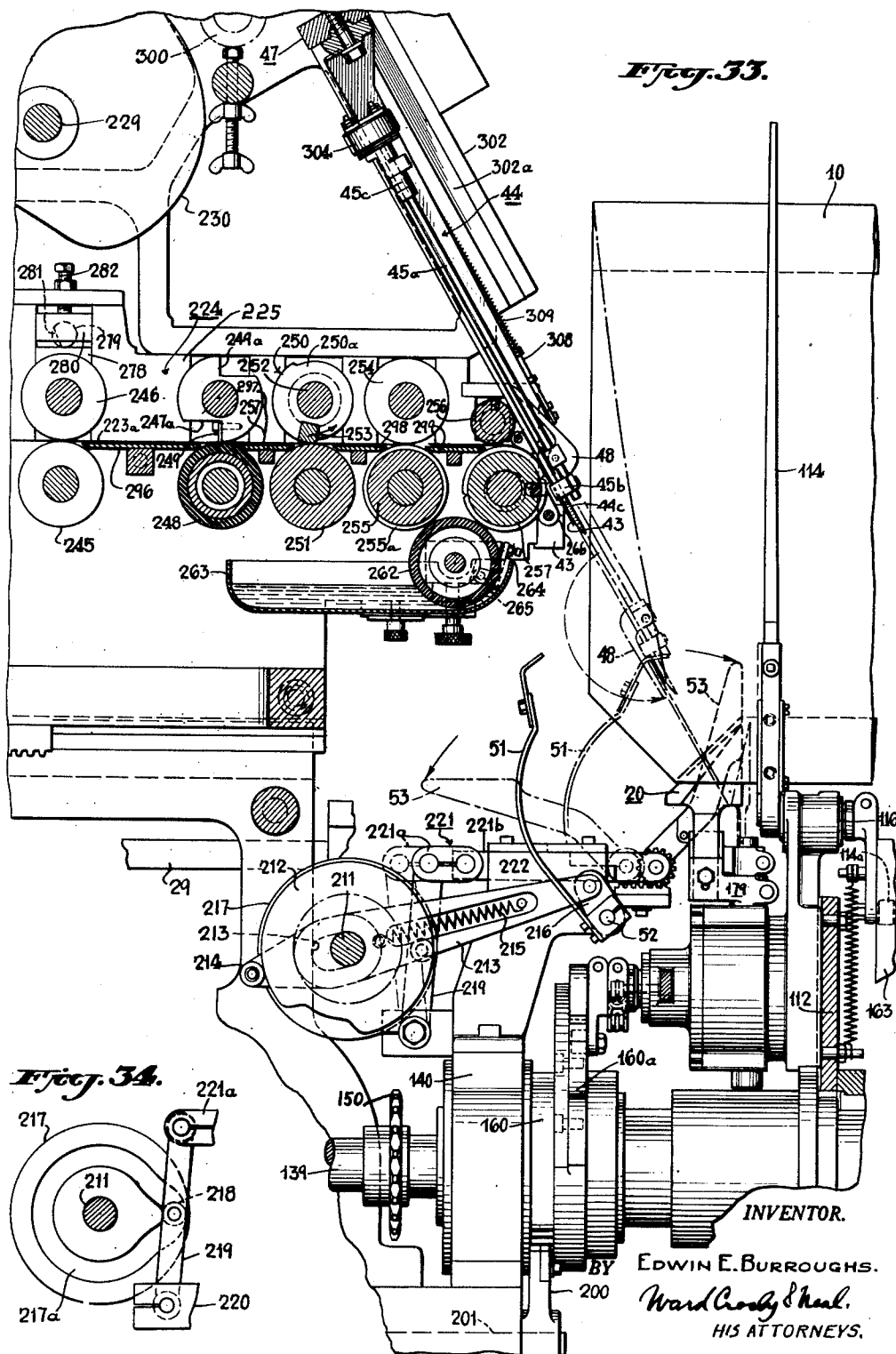
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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Fig. 43.

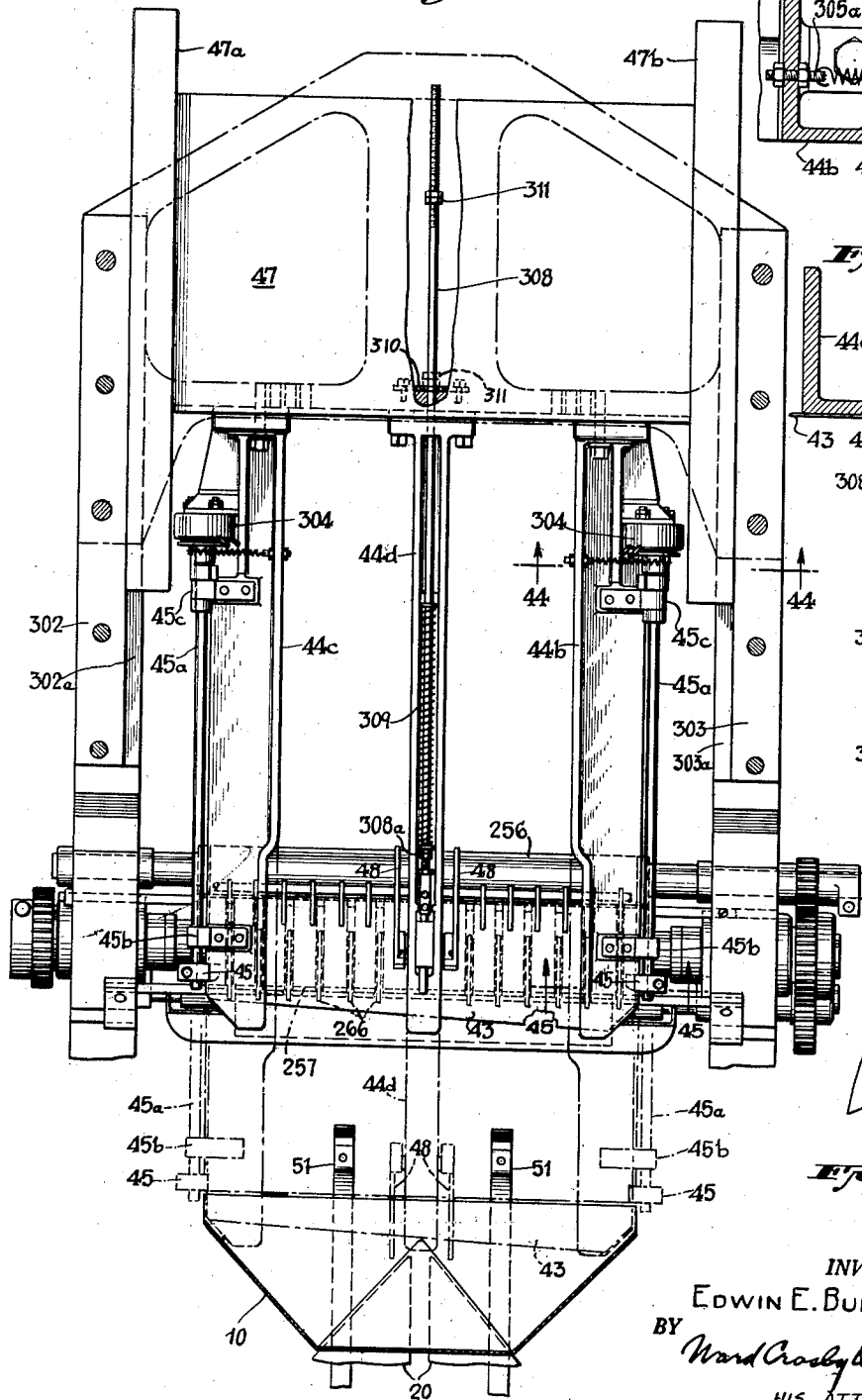


Fig. 44.

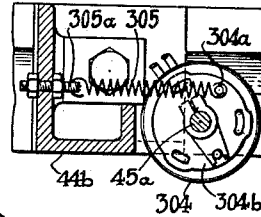


Fig. 45.

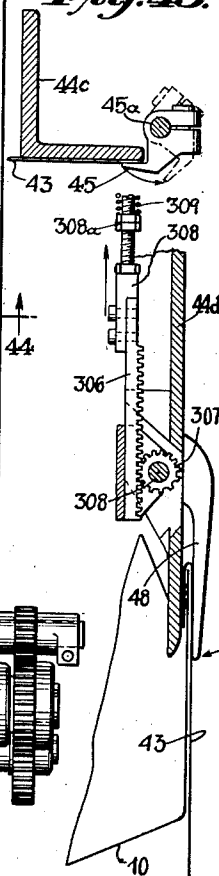


Fig. 46.

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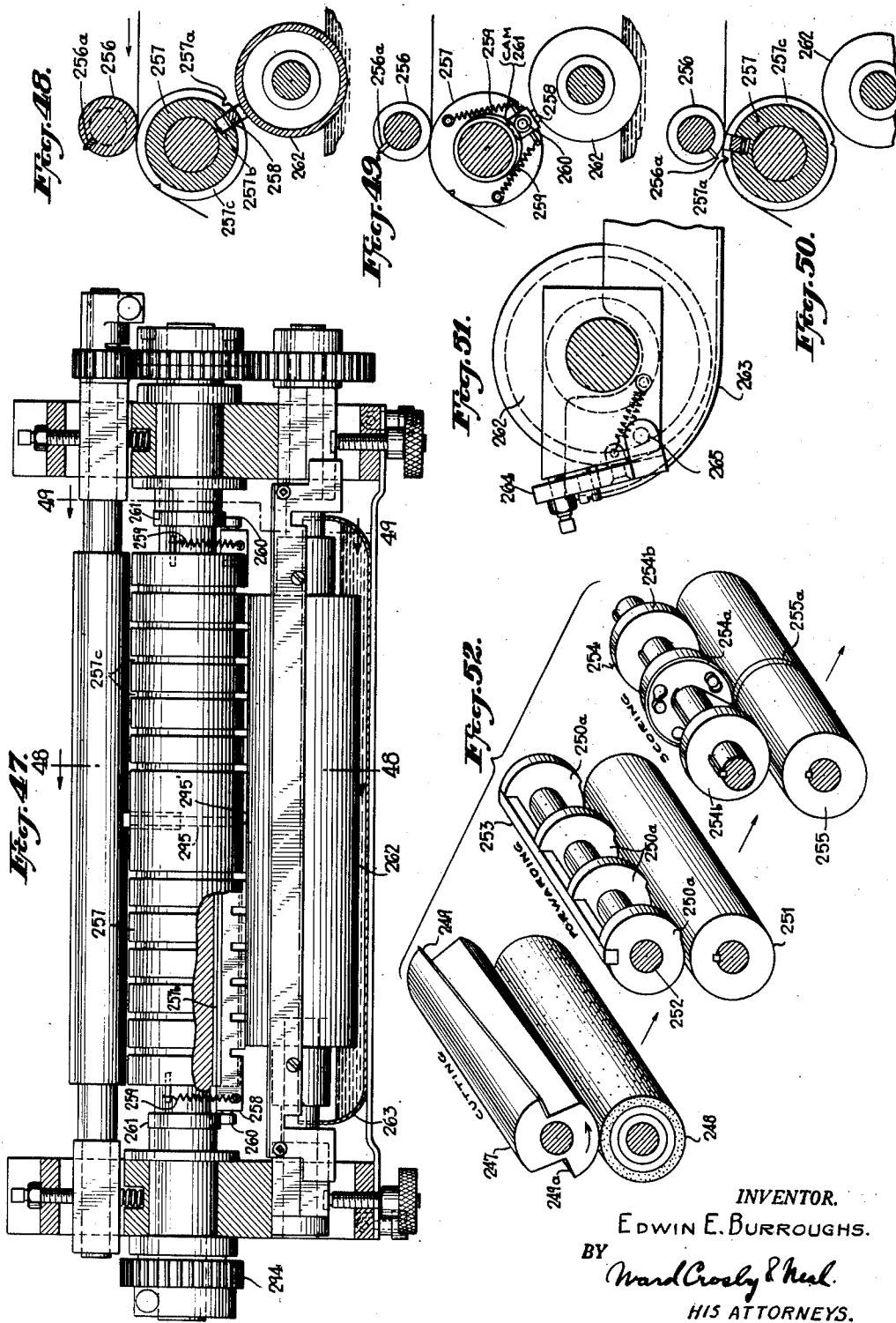
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18 Sheets-Sheet 16



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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

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Fig. 53.

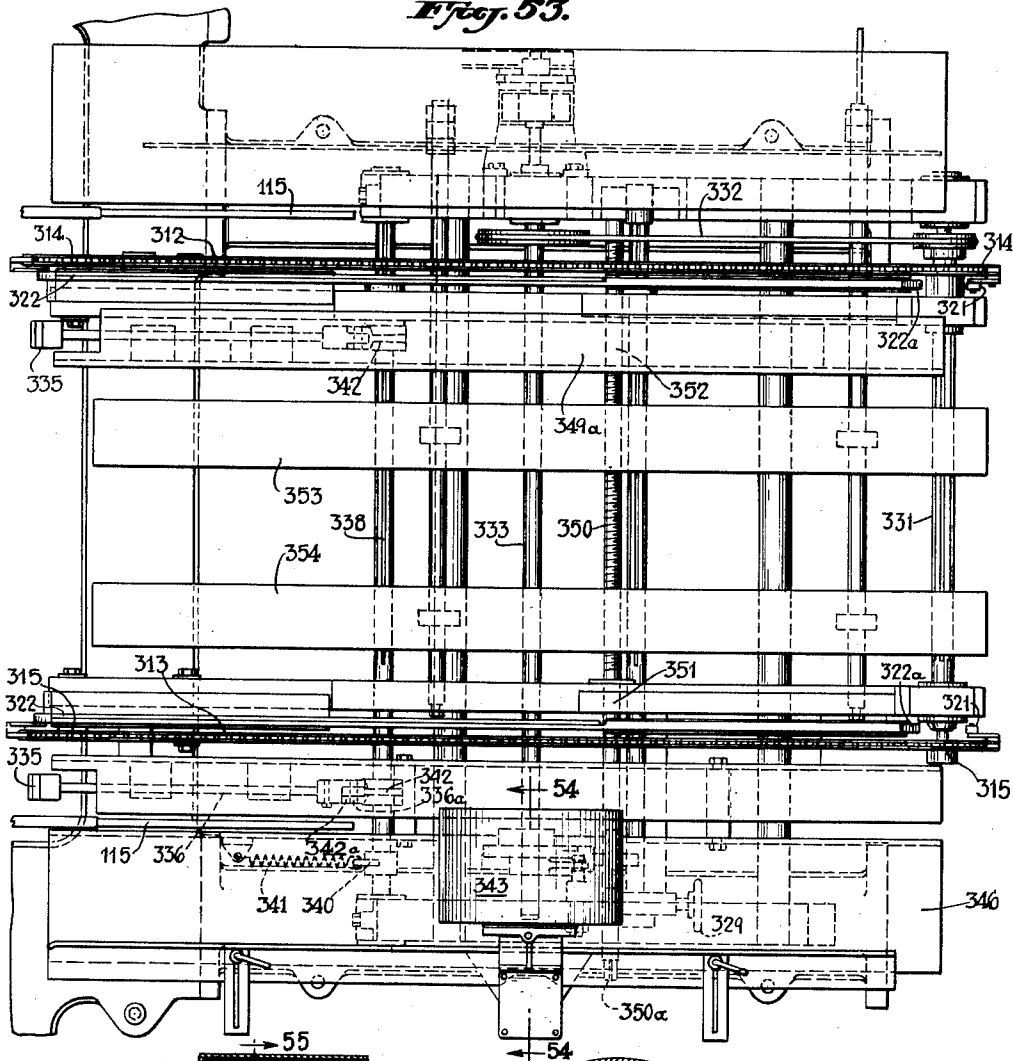


Fig. 54.

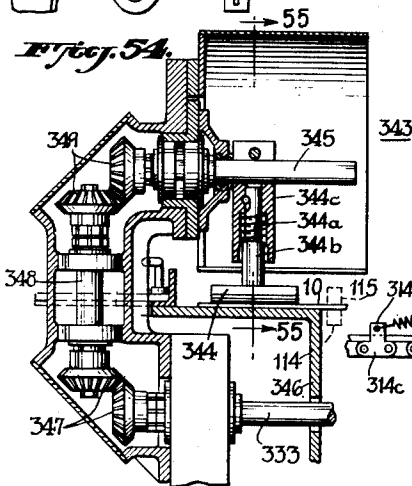
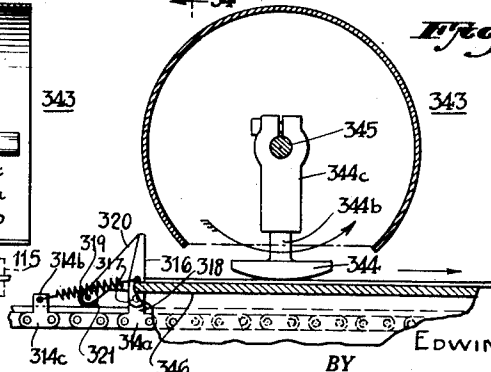


Fig. 55.



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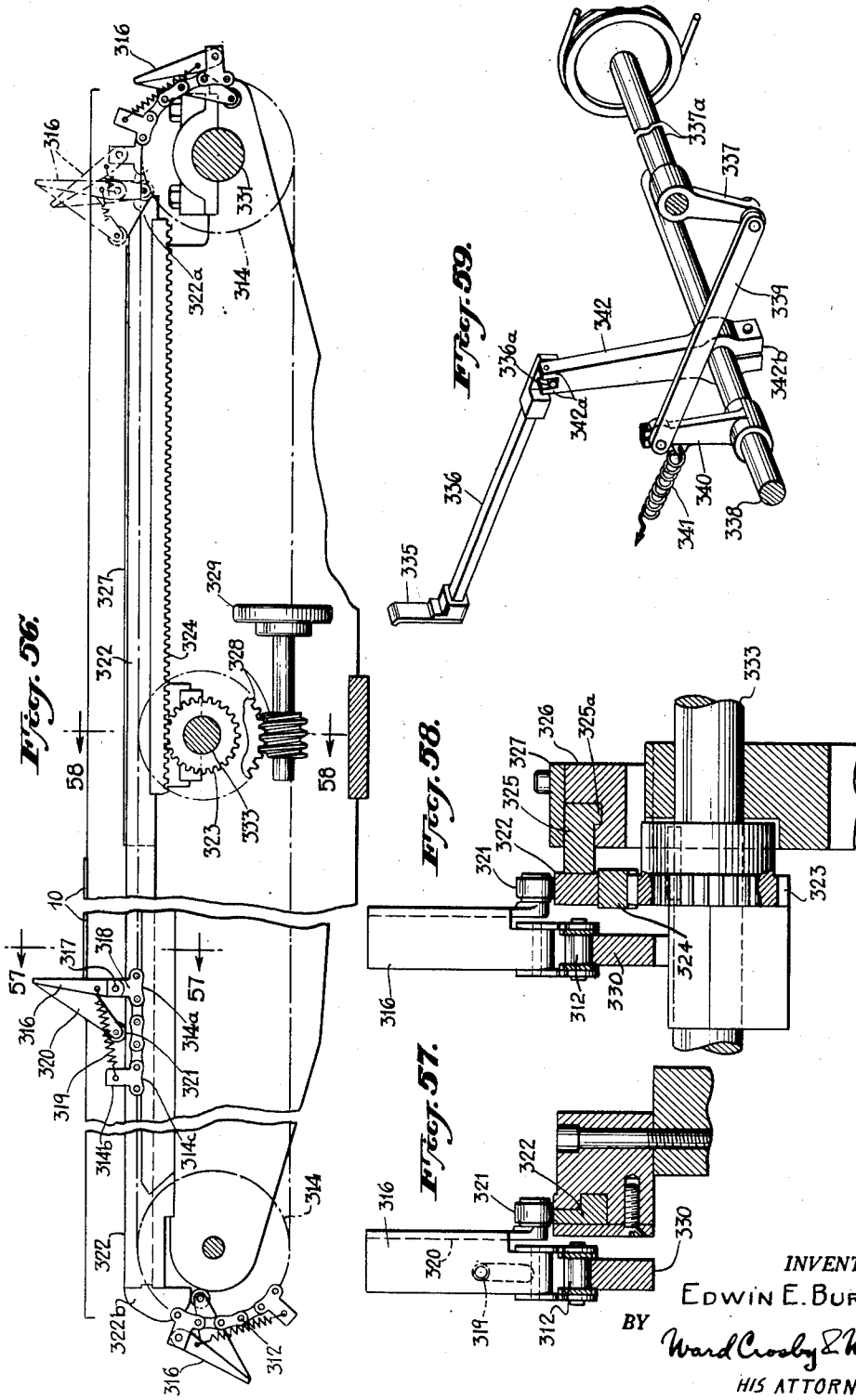
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MECHANISM AND METHOD FOR FORMING SLEEVED VALVE BAGS

Filed Sept. 29, 1949

18 Sheets-Sheet 18



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UNITED STATES PATENT OFFICE

2,643,588

MECHANISM AND METHOD FOR FORMING
SLEEVED VALVE BAGS

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corporation of New York

Application September 29, 1949, Serial No. 118,545

27 Claims. (Cl. 93—8)

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This invention relates to apparatus for manufacturing valve bags of paper or other thin sheet material, and more particularly relates to a machine for shaping or forming the corners of flattened bag tubes for the formation of valves therein and, if desired, for substantially concurrently forming and securing in place in the valve corners supplemental sheets adapted to form closure sleeves or valve extension closure flaps for the valves in the finished bags. The machine of the invention is adapted for association with sewing apparatus for forming sewn seams across the ends of the bag tubes to close same shortly after the valves and sleeves have been formed with the supplemental sheets therein.

Heretofore, generally it has been the practice to shape the valve parts of bag tubes of the character above set forth by the use of suitable devices or machines, and if the valve is to have a supplemental sheet to form a sleeve or flap extension, such sheet has been inserted manually. This, of course, has been an expensive operation requiring large numbers of workers trained to handle rapidly the usually large and cumbersome bags so as to be able quickly to open the valved corners and insert in accurate position the previously formed supplemental sheets. Aside from the number of workers required, this operation is undesirably time consuming as compared with other operations performed automatically in the production of such bags.

So far as is known, no practical or suitable automatic machinery for performing such sleeving operations has been suggested or gone into use. In those cases where the bag tube has a valve formed therein prior to the application of a supplemental sheet, the proper and accurate insertion of the latter by automatic means in folded condition with a portion glued upon or under one or more of the plies of the valve flap, has involved serious difficulties.

Apparatus of this character heretofore suggested has failed to position accurately and prepare a bag tube valve corner for the insertion of a supplemental sheet. This has resulted in a high percentage of rejected bags, for example, because the supplemental sheet has been positioned off center relative to a valve flap of such corner.

In accordance with the present invention, a machine is provided which overcomes the above noted difficulties and performs the function of "valving" the bag tube or shaping the valve therein substantially concurrently with the steps of applying, folding and securing in place the

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supplemental sheet. The machine preferably is equipped with mechanism for substantially concurrently cutting and otherwise preparing the supplemental sheets from a continuous band of paper or other sheet material from which they are formed.

The operations of opening the mouth of the bag tube at the valve corner thereof, whereby a valve flap is formed, folding in the corner or valve flap to form a valve, the insertion and shaping of the supplemental sheet therein, followed by the closing or flattening of the corner, necessarily involve a succession of abrupt and relatively complicated movements of the machine parts. In order to perform this succession of operations at a rate of speed accurately and without undue pounding or vibration of machine parts, or injury to the bag, the various necessary steps are, in accordance with the preferred form of the invention, performed in rapid succession with the bag tube positioned at successive closely spaced stations.

In order to feed the bags, which may be of different sizes and types, to the first of these stations and accurately position same with proper timing, a feeding mechanism is provided which is adjustable for various sizes of bags. The timing of the feeding mechanism is adjustable with respect to the valving and sleeving mechanism so that each bag tube corner which is to be valved will arrive at the proper station at the proper time regardless of the dimensions of the bag tube.

At the outlet side of the machine a novel arrangement of conveying equipment preferably is provided for carrying the bags, after the valving and sleeving, to automatic sewing equipment so arranged as to close one or both ends of the bag with sewn seams as rapidly as they are supplied from the valving and sleeving machine.

Various other objects, features and advantages of the invention will clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of the specification and illustrate by way of example one form of apparatus which may be used in carrying out the invention. The invention resides in such novel features, arrangements and combinations of parts and method steps as may be shown and described in connection with the apparatus herein disclosed.

This application is a continuation-in-part of my co-pending application, Serial No. 667,184, filed May 3, 1946, for mechanism and means for forming sleeved valved bags (now abandoned).

In the drawings:

Fig. 1 is a perspective view of a portion of a bag tube undergoing one of the initial operations in the formation of a bag valve, namely, the bias scoring of the valve corner of such tube;

Fig. 2 is a perspective view of a gusseted bag tube portion having the gusset thereof spread by a gusset wedge preparatory to the insertion of a spreader device;

Fig. 3 is a perspective view of a bag tube portion in station No. 1 after being engaged by a bag tube carrier including a clamping mechanism (pair of fly sticks) and after a valve corner spreader (butterfly) is inserted in the gusset thereof preparatory to spreading same;

Fig. 4 is a perspective view of such bag tube portion in station No. 2 wherein the tube end or valve corner is spaced by a spreading of the elements of the corner spreader, that is, the spreading of the wings of the butterfly;

Fig. 4a is a plan view of the parts shown in Fig. 4 with the addition of a supplementary tube end spreader element known as an umbrella element;

Fig. 5 is a perspective view of the bag tube end spread under the combined influence of the spread butterfly and the spread umbrella element;

Fig. 5a is a plan view partly in section of the parts shown in Fig. 5;

Fig. 5b is a side elevation showing the several positions of the umbrella element and a valve flap press ram relative to the spread bag tube end;

Fig. 5c is a plan view of the parts shown in Fig. 5b;

Fig. 5d is an end view of the parts shown in Fig. 5b;

Fig. 5e is a sectional view taken substantially along line 5e—5e of Fig. 5d;

Fig. 6 is a perspective view similar to Fig. 5 showing in addition the valve flap press ram which presses a base portion of the valve flap;

Fig. 6a is a plan view of the parts shown in Fig. 6;

Fig. 7 is a perspective view of the spread tube end in station No. 3 including portions of a supplementary sheet applying device including a reciprocating ram having such a sheet gripped thereby in position just prior to application to the tube;

Fig. 7a is a plan view of another type of supplementary sheet which may be applied by the apparatus embodying the invention;

Fig. 8 shows the parts shown in Fig. 7 in a subsequent operating position wherein the supplementary sheet is applied to form a tuck-in type sleeve;

Fig. 9 illustrates in perspective the parts shown in Figs. 7 and 8 but with the sheet applying device being withdrawn away from the bag tube and in addition parts of a so-called sleeve hold-down finger unit in operation for holding the sleeve in position while said device is being withdrawn;

Fig. 10 shows in perspective a tucker blade engaging the spread tube end or valve corner and supplementary sheet just prior to closing of the butterfly and to the formation of a sleeved valve;

Fig. 11 illustrates a sectional view of the valve corner when the butterfly is substantially closed and the tucker blade is tucking in the valve;

Fig. 12 is a perspective view of a fragment of the bag tube showing a sleeved valve formed in accordance with the invention;

Fig. 13 is a plan view, with certain parts omitted for clarity, of a mechanism for conveying bag tubes to and positioning same relative to the tube carrying or clamp device which successively positions each tube at the several stations where the valve is formed and the supplementary sheet inserted;

Fig. 13a is a schematic view in side elevation of means for feeding bag tubes into the apparatus;

Fig. 13b is a schematic view also in side elevation of certain of the parts shown in Fig. 13 including an alternative type of precreasing mechanism;

Fig. 14 is a plan view of a bag tube precreasing device adapted for forming a diagonal fold line in each bag tube at the valve corner thereof;

Fig. 15 is a fragmentary view of a valve corner of a bag tube bearing a fold line formed by said precreaser device;

Fig. 16 is a fragmentary view, partly in section and with parts broken away, taken substantially along lines 16—16 of Fig. 14;

Fig. 17 is a fragmentary sectional view of the precreasing device taken substantially along line 17—17 of Fig. 14;

Fig. 18 is a side elevation of a bag tube forwarding or positioning device for urging each bag tube successively against a limit stop for aligning the tube relative to the bag tube carrier or fly sticks;

Fig. 19 is a sectional view of the parts shown in Fig. 18 taken substantially along line 19—19 thereof;

Fig. 20 is a schematic representation, with certain parts in section, of the operative interconnection between a main drive power source and certain principal parts of the apparatus;

Fig. 21 is a side elevation of the bag tube carrier, which in the form shown is a paddle-wheel-like device, together with associated valve corner spreader means, which carrier is adapted for grasping each bag tube successively and intermittently moving same to the various valving and sleeving stations;

Fig. 22 is a side elevation of a cam for controlling the opening and closing of the tube clamping elements of the bag tube carrier;

Fig. 23 is a fragmentary sectional view taken substantially along line 23—23 of Fig. 21;

Fig. 24 is a side elevation of the parts shown in Fig. 23;

Fig. 25 is a side elevation showing in detail the wedging device, illustrated in Fig. 2, for spreading the gusset of a bag tube to facilitate the insertion therein of valve corner spreading means such as the butterfly shown in Figs. 2 and 23;

Fig. 26 is a fragmentary view of the valve corner spreading means inserted in a gusset of a bag tube;

Fig. 27 is a perspective view, partly in section and with parts broken away and also with certain parts omitted for clarity, of the mechanism for advancing the paddle-wheel-like bag tube carrier and for governing the opening and closing of the bag tube clamping elements thereon;

Fig. 28 is a perspective view, partly in section and with parts broken away and omitted for clarity, of a valve sleeve forming apparatus, portions of the mechanism for inserting the valve sleeve and also portions of the means for positioning the bag tubes in the bag carrier and forming the valve in such tubes;

Fig. 29 is a plan view partly in section and with parts broken away of the bag tube carrier and of portions of a drive mechanism for con-

trolling certain of the valve forming and sleeve inserting elements;

Fig. 30 is a top plan view of the mechanism for holding a supplementary sheet in position upon a valve flap, portions of which are also shown in Fig. 9, together with the tucker blade for folding inwardly of the bag tube such valve flap with the supplementary sheet;

Fig. 31 is a front view of the mechanism for forming the supplemental sheets and inserting same;

Fig. 32 is a side elevation of the parts shown in Fig. 31;

Fig. 33 is a side view partly in section and with parts broken away and on a magnified scale of a portion of the mechanism for inserting the supplemental sheet into an open bag corner and for tucking such sleeve and valve corner inwardly to close such corner;

Fig. 34 is a side elevation of a cam and certain of its adjacent parts for controlling the valve corner tucking blade shown in Figs. 9-11, inclusive, and 33;

Fig. 35 is a side view partly in section and with parts broken away of a cam and cam drive assembly for controlling the press ram of Figs. 5 and 6, and also showing portions of a bag aligner;

Fig. 36 is a sectional view taken substantially along line 36-36 of Fig. 35;

Fig. 37 is a side elevation partly in section and with parts broken away of the drive assembly for the valve flap press ram;

Fig. 38 is a sectional view taken along line 38-38 of Fig. 35 showing a cam and its associated roller for controlling a transverse bag aligner device;

Fig. 39 is a side elevation partly in section and with parts broken away of a spur gear differential assembly for the sleeve and tucking blade mechanism;

Fig. 40 is a side elevation also partly in section and with parts broken away of a notch cutter and its adjacent parts for forming notches upon the supplementary sheets;

Fig. 41 is an end view on a magnified scale and with parts broken away of the cutter shown in Fig. 40 with a fragment of a roller cooperating therewith;

Fig. 42 is a fragmentary plan view of a band of sheet material moving over such roller, the band bearing a cut formed by the notch cutter of Fig. 40;

Fig. 43 is a front elevation of portions of the supplementary sleeve applying means including the reciprocating ram also shown in Figs. 7, 8 and 9;

Fig. 44 is a sectional view taken substantially along line 44-44 of Fig. 43;

Fig. 45 is a sectional view taken substantially on line 45-45 of Fig. 43;

Fig. 46 is a fragmentary view in side elevation, and partly in section, of the mechanism for folding a supplementary sheet over a portion of a bag valve, said mechanism comprising a portion of the ram mechanism shown in Figs. 8 and 43;

Fig. 47 is a front elevation of a portion of the sleeve-forming device, partly in section and with parts broken away, and illustrating the glue applying device, together with certain adjacent parts;

Fig. 48 is a sectional view taken substantially on line 48-48 of Fig. 47;

Fig. 49 is a sectional view taken substantially along line 49-49 of Fig. 47;

Fig. 50 is a transverse sectional view of the rollers shown in Fig. 47 with parts thereof in a different operating position as compared to Fig. 49;

Fig. 51 is an end view, partly in section, of a ductor roller as employed in the device of Fig. 47;

Fig. 52 is a perspective view of the scoring, forwarding and cutting rollers employed in the sleeve-forming device;

Fig. 53 is a plan view of the mechanism for removing the bag tubes from the tube carrier after valving and sleeving and conveying same to a sewing machine;

Fig. 54 is a sectional view taken substantially on lines 54-54 of Fig. 53 and illustrating a rotating segmental element for providing a final pressing of a valved corner of a bag tube;

Fig. 55 is a sectional view of the parts shown in Fig. 54 taken substantially along lines 55-55;

Fig. 56 is a side elevation, partly in section and with parts broken away of a conveyor mechanism employed in Fig. 53;

Fig. 57 is a sectional view taken substantially along line 57-57 of Fig. 56;

Fig. 58 is a sectional view taken substantially along line 58-58 of Fig. 56; and

Fig. 59 is a perspective view of a bag tube pusher unit employed in connection with the mechanism of Fig. 53 for urging the bag tubes out of the carrier (fly sticks) and onto the removal conveyor shown in Fig. 56.

Summary of operation

A general description of the operation of the apparatus upon a bag tube will first be set forth and thereafter a detailed description of the mechanism will follow.

Reference is made to Figs. 1-12, inclusive, which illustrate portions of the mechanism and certain of the steps for forming a sleeved valve bag in accordance with the present invention.

The form of the invention shown is adapted for forming valved bags, or sleeved valve bags from flat bag tubes. If desired the apparatus also can form valved bags each having a supplemental sheet applied to the valve for forming a valve flap extension sheet within the bag.

It should be noted that, although for simplicity, the bag tubes are shown in the drawings as if they were each of a single thickness, in practice in most cases they will comprise multiply flattened tubes having a folded-in gussets along their sides, a gusset being illustrated in Figs. 2 and 25.

Flattened gusseted bag tubes are fed successively along a common path to the apparatus and in one aspect of the invention each of the tubes is subjected to a so-called corner precreasing operation which is illustrated in Fig. 1. This precreasing is also referred to as bias scoring and is effected for the purpose of providing predetermined diagonal fold lines to facilitate the forming of a valve flap, as will appear hereinafter, in a symmetrical position relative to the sides of the bag and the bag tube, whereby the valve will be formed in proper alignment with such tube. The precreaser forms a score line at a 45° angle with the leading edge of the bag tube as shown in Fig. 1. This 45° score line is positioned at the corner of the tube which is to be valved and is of a length which is determined by the size of the valve to be formed. Where a bag tube such as 10 is pro-

vided with a notched valve corner having a notch portion as at 11 (Fig. 1), the 45° precrease line is formed to extend between an inner corner 12 of the notch down to the leading edge 13 of the tube. One form of precreasing device is illustrated in Figs. 14, 16 and 17 and will be described further hereinafter. Another form of precreasing device is shown in Fig. 13b and will also be described hereinafter.

The invention is not limited to an apparatus having a device for forming the bias score line nor is the method for forming a valve bag so limited. However, this score line assists in producing uniform valves and reduces the percentage of "rejects." One of the main reasons why such a score line assists in producing uniform valves is that when the valve corner is spread apart to form a valve flap, as at 14 (Fig. 4), which flap is provided with a valve flap extension as at 14a, preselected diagonal fold lines are formed as at 15. The latter, when the valve is finished, assist strongly in preventing such valve extension from being off center and the side edges, as at 14b (Fig. 4) of the flap extension, can be readily folded inwardly with the valve flap, as will also appear hereinafter, to a position where they are parallel with top edges 16 of the tube mouth as is illustrated in Fig. 12.

Another advantage of the 45° score line 15 is that it facilitates the positioning of a supplementary sheet, such as a valve sleeve, by a sleeving device in that such device can more easily apply a supplemental sheet or sleeve to the valve extension in accurately aligned position after the 45° score line is formed.

The 45° score line can be formed, for example, by a suitable reciprocating blade 17 which creases the bag tube by urging the tube portions thereunder into a groove 18 (Fig. 17) in a base plate 19, as will appear more fully later.

In order to facilitate the insertion of a valve corner spreading device, known generally as a butterfly, and shown in Fig. 3 at 20, it has been found desirable to spread the leading gusset of the bag tube, for example, by means of a gusset wedge as at 21 (Figs. 2, 3 and 25). The bag tubes, such as 10, after being precreased as in Fig. 1, are grasped by tube grippers as at 22 (Fig. 1) and are urged toward the valve corner spreading device. The grippers 22 are mounted upon an endless chain as at 23, there being one such chain near each extremity of the bag tube whereby the tubes are successively gripped and conveyed toward the valver and sleever device. En route to such device the gusset wedge 21 is interposed in the path of and is inserted into the oncoming gusset and spreads same. The gusset wedges are preferably mounted upon a suitable endless chain 24 which is somewhat shorter than the conveyor chain 23.

The bag tube conveyor 23 and grippers 22 move the bags successively to a tube carrier including a plurality of bag tube clamp elements which are illustrated in detail in Fig. 21 and which are to be described more fully hereinafter. An individual clamp element is shown, for example, in Figs. 3-6, which illustrate an individual tube grasped and advanced thereby. These clamp elements are, for example, arranged in paddle-wheel-like disposition, that is, in spaced position for holding a succession of the flattened bag tubes respectively in side-by-side relationship, there being suitable mechanism for supporting the clamp elements and for advancing same step-by-step to carry the bag tubes from a feeding station to succeeding stations, including a sleeve applying and a

discharge station. Clamp element opening and closing devices are operatively associated therewith and with said advancing mechanism for closing each pair of clamping elements at said feeding station and for opening same at said discharge station. Power operated devices are operatively connected to act in timed relation with the step-by-step advancing mechanism for forming the valve and inserting a supplementary sheet such as a sleeve, as will appear hereinafter.

The above-mentioned bag tube clamp elements are also referred to as fly sticks, there being two pairs of flysticks for grasping each bag tube, one pair near each extremity of the tube.

Referring now to Fig. 3, the bag tube 10 is conveyed by the moving grippers 22 on chains 23 into a pair of bag clamps which initially are opened, as indicated in broken lines, there being a suitable limit-stop for governing the distance through which the tube is advanced between the open fly sticks, as will appear hereinafter. Also the bag tube is aligned transversely of its path of motion by means of a bag pushing device which also will be described hereinafter. The limit stops for positioning the bag tubes within the fly sticks are, in the form shown, so located that they arrest the forward motion of the bag tube preferably at such a location that points 20a of the butterfly are preferably about one-half inch from contact with the inner or center fold line of the gusset. The reason for this is that, in the embodiment illustrated, when the butterflies are spread or opened, as in Fig. 4, the inner adjacent edges thereof are separated and the extension of the lines running along outer angular sides 20b of the wings of the butterfly intersect substantially at a center or inner fold line 14c (Fig. 4) of the gusset, an extension of which at 14e comprises the center fold line of the valve flap. The bag tube is thus accurately positioned between the open fly sticks and such sticks are then closed automatically to the position as indicated in solid lines. The bag tube gripping devices which have advanced the tube into the fly sticks are automatically released as by a suitable cam mechanism. When the bag tube is advanced to its innermost position between the fly sticks, the above-mentioned valve corner spreader or butterfly 20 is inserted into the leading gusset of the bag at a point adjacent the fly sticks, as shown in Fig. 3. Such insertion is facilitated by the above-described gusset wedge 21 and also by the formation of the 45° score line which, by creasing the paper, causes the gusset to open slightly near the valve corner.

The bag tube thereafter is advanced from station No. 1 (Fig. 3) to station No. 2 (Fig. 4) and during the travel to station No. 2, or after arrival at such station, the butterfly 20 is spread, as shown in Fig. 4, thereby spreading the gusset and forming the above-described valve flap 14, which now is considered to be in an accessible or exposed position with the valve flap extension 14a thereof extending generally in an upward and outward position as viewed in this figure.

The butterfly is opened, as in Figs. 4 and 4a, preferably to an extent of about 150°. The exposed valve flap 14 is accurately positioned by virtue of the previously formed diagonal fold lines 15, and the valve flap center fold line 14e is substantially in alignment with the plane of the bag tube as held by the fly sticks.

At station No. 2, the valve flap is further acted upon to insure that it is accurately formed and positioned for folding inwardly to form the valve and also accurately formed and posi-

tioned for the application of a supplemental sheet. This is accomplished by means shown in Fig. 5. As shown in this figure, there are two diagonal fold lines or creases 15 on the bag tube formed by the above-described precreaser. The invention, in a preferred form thereof, includes means for forming a sharp crease along a line 14d in such a manner that the line of the crease interconnects such diagonal fold lines. That is, the line of the crease along 14d extends from one extremity of one of the lines 15 to an analogous extremity of the other line 15. Such crease formed along line 14d is referred to variously as a "valve flap base fold line," or a "valve flap base fold crease."

The valve flap base fold crease at 14d is formed, in this embodiment, by pressing a portion of the valve flap against the spread butterfly 20. Prior to such pressing the valve flap and adjacent portions of the open tube end are stretched or spread in order to make substantially taut those portions of the valve flap which are to be so pressed.

The forming of the valve flap base fold crease at 14d assists in accurate valve formation by reducing the chances of the flap being formed unsymmetrically relative to the valve flap center fold line 14e. Also, the forming of such base fold crease or line reduces the possibility of the valve flap moving out of a symmetrical position relative its bag tube and relative to butterfly 20 while the machine is operating on the tube. Thus the formation of such crease assists in holding the valve flap 14 in a preselected position for the application of a supplemental sheet if it is desired to apply one. Whether or not a supplemental sheet is to be applied, the formation of the base fold crease at 14d assists in accurate and uniform valve formation by providing a positive boundary for the lower portion (Fig. 6) of the valve flap when the latter is tucked inwardly (Figs. 10-12) by a tucking blade to form the valve as will be explained below. Such positive boundary tends to prevent a rolling of the sheet material comprising the tube whereby the valve might be malformed during such inward tucking.

Such means for adequately spreading the valve flap 14, in the form of the invention shown, preparatory to the valve flap pressing operation, comprises a so-called umbrella element 25 comprising a central umbrella ram 26 mounted for reciprocation relative to the tube end, and having pivotally mounted thereupon a pair of umbrella arms 27 which normally are in a withdrawn position, as shown in broken lines in Fig. 5, but which by suitable mechanisms are adapted for being snapped forward to the position shown in solid lines. Ram 26 preferably has a flattened wedge-like leading face as at 26a. When the bag tube reaches station No. 2, the umbrella ram 26 is thrust into the open mouth of the tube end and the flattened wedge-like forward face thereof is urged therein and acts to center the spread mouth of the tube end, including the opposed side surfaces of the tube, as at 10a and 10b. Thereafter the umbrella arms 27 are snapped forward which further spreads the opposed side walls 10a, 10b and thereby spreads the valve flap 14 so that it assumes the position shown in Fig. 5 as compared to that in Fig. 4 whereby such flap is substantially flattened. Furthermore, the umbrella arms 27 upon being snapped into substantial alignment, as in Fig. 5, will move behind the valve flap extension 14a

(Fig. 5), the umbrella element being positioned well above the base fold line 14d, as viewed in Fig. 5, so that this will occur. Thus the portion of the valve flap along the base fold line is pulled to a more taut condition than theretofore and is prepared for a valve press ram, as at 28, having a leading face in the shape of a flattened wedge as at 28a, the press surfaces of which are disposed at an angle which is substantially the same angle to which the butterfly wings have been spread.

The range of angular movement of the butterflies is preferably between 145° and 155° and, as shown, is spread to 150°.

The valve press ram 28 thereafter is thrust against the valve flap, as shown in Fig. 6, and presses same against the open butterflies 20, whereby the above-described valve flap base fold crease is positively formed along line 14d.

The actions of the umbrella arms and valve flap press ram are illustrated further in Figs. 5a, 5b, 5c, 5d and 5e. In Fig. 5a the umbrella element has been moved to its outermost position against the open tube end and the umbrella arms have been snapped into substantial alignment, at which point the valve press ram 28 has not yet reached the valve flap for pressing same. This is further illustrated in Fig. 5b wherein the initial position of the umbrella element is shown in solid lines and its final position in broken lines. The same is true with respect to the valve press ram 28. In the form shown in Fig. 5b, the valve press ram 28 is mounted upon a reciprocating plunger 29 which also supports the umbrella ram element 25 by means of a suitable arm interconnection 30. The interconnection 30 comprises an arm which can be adjustably positioned axially relative to the press ram 28, whereby the distance between the umbrella arms 27 and such ram can be controlled. Upon the upper end of the arm 30, as viewed in Fig. 5b, there is secured an umbrella support member 31 which is designed for holding element 25 in slidable engagement therewith for sliding motion along a line parallel with the reciprocating motion of the press ram 28. In the form shown, a pair of slide rods 32 pass through suitable bores in the support element 31 and upon said slide rods 32 there is mounted the umbrella ram 26 and thus the umbrella arms 27. The rods 32 are mounted in the support element 31 with their axes in the same plane. One extremity of each of the rods 32 is embedded in a suitable recess as at 26b in the umbrella ram element 26 and the opposite extremities of said rods are secured together by a cross bar as at 33. Plate member 34 is mounted upon the umbrella ram element 26 for supporting the means for actuating the umbrella arms 27. As shown in Fig. 5b, the plate member 34 is further supported by means of a yoke 35 having suitable perforations through which extend the rods 32 and preferably the yoke 35 is adjustably secured to said rods. Thus, the umbrella element 25 is mounted for linear reciprocation relative to the support element 31. Such umbrella element is urged against one limit of its linear motion by means of a spring 36 which is secured at one extremity thereof to said support element 31 and at the other extremity thereof to the yoke 33. Thus the umbrella element is held, as in Fig. 5b, in a position which precedes the valve press ram 28 along the path of the movement thereof. When the leading face 26a of the umbrella element 25 reaches the limit of its motion, as shown in Fig. 5b in broken lines, the spring 36 will be overcome

by the thrust upon the plunger 29 and the valve press ram 28 will be urged into position as in Fig. 5e.

The umbrella arms 27, in the embodiment shown, are actuated by rotary solenoids 37, there being one solenoid for each arm. The solenoids are operatively interconnected with the umbrella arms 27 by means of linkages, each consisting of an arm 38 which interconnects levers 39 and 40, respectively secured to the rotary solenoid 37 and a pivot rod 41, the latter having secured thereto its respective umbrella arm 27. Each solenoid is held in a preselected inactive position by means of springs 42 which urge levers 39 against a limit stop (not shown) whereby the umbrella arms 27 are normally positioned as shown in solid lines in Fig. 5c. Upon actuation of the solenoids, they are angularly shifted to the position shown in broken lines in Fig. 5c. If desired, suitable alternative means may be employed in lieu of rotary solenoids 37. For example, suitable air operated power cylinders may be employed.

The umbrella element 25 and valve press ram are thereupon withdrawn and the bag tube is advanced to station No. 3 where, if desired, a supplementary sheet may be applied.

A summary of a desired sequence of events during the withdrawal of the valve press ram and umbrella element at station No. 2 is as follows: (1) the valve press ram is first withdrawn, and (2) thereafter the umbrella element is withdrawn while the arms 27 thereof are substantially in alignment. The umbrella arms now perform another function, namely, the thrusting outwardly, as viewed in Fig. 6, of the valve flap 14 and particularly valve flap extension 14a. The flap 14 should be so thrust at this point because, after the action of the valve press 28, the flap might remain too close to or hug the open tube end and not be in proper position for the insertion of a supplementary sheet. It has been discovered that without this outward thrusting or pulling action upon the valve flap there is a substantial tendency for it to hug the spread open tube end whereby a supplementary sheet inserting ram 44 cannot get into the spread valve corner, that is, cannot get behind the exposed valve flap 14 to insert the supplementary sheet. The umbrella arms preferably remain in substantial alignment, as in Fig. 6, until after they have been withdrawn from the valve flap whereupon they are snapped back to their normally disposed position, as shown in solid lines in Fig. 5c.

The apparatus is adapted for applying a supplementary sheet of the type which provides a so-called tuck-in-valve sleeve, such supplementary sheet being illustrated as at 43 in Figs. 7-12, inclusive. And the apparatus also is adapted for the application of a supplementary sheet which constitutes a flexible valve flap extension sheet, which extends inwardly of the completed bag and is not folded over the edge of a valve flap extension. The latter type of supplementary sheet is shown in Fig. 7a and will be described hereinafter. The present apparatus applies a supplementary sheet from which a tuck-in sleeve is formed as follows: a reciprocating supplementary sheet applying device referred to as a sheet ram or sleeve ram is provided as at 44, Fig. 7, which is mounted for reciprocating motion relative to the spread valve flap and preferably is disposed for moving such sheet downwardly into the exposed valve flap at an angle of about 45°, as is also illustrated in Fig. 33. This sleeve ram 44 is provided with gripper fingers on either side there-

of as at 45 near the leading edge or nose thereof, whereby the supplementary sheet 43 can be gripped at either side thereof by urging same against the underside of the ram 44. Each supplementary sheet is provided with adhesive preferably in aligned dots thereon, as at 46, along the leading margin for adhering same to the inner surface of the above-described valve flap extension 14a. The sleeve ram 44 is moved downwardly in the direction of the arrows, as shown in Fig. 7, whereby the supplementary sheet is so inserted. The sleeve ram is preferably shaped at or along the nose thereof in the form of a wedge for insertion behind the valve flap as viewed in Figs. 7 and 8, whereby such flap may be spread or stretched taut for the application of the supplementary sheet. The corners of the ram, as at 44a, are filleted substantially at an angle of, for example, 45°, to facilitate insertion behind and the stretching of the valve flap.

As shown in Figs. 7 and 8, the ram 44 is composed of three elements 44b, 44c and 44d. Elements 44b and 44c comprise side portions and element 44d is a central portion, all of which are secured preferably at the upper ends thereof (Fig. 7) to a suitable reciprocating support 47. The central element 44d has secured thereto a supplementary sheet flip-over or fold-over device which is positioned for folding over such sheet along a line which extends between the side gripper fingers 45 as is illustrated in Fig. 8. The gripper fingers 45 are positioned for grasping the supplementary sheet 43 at a preselected position, whereby the fold-over line extending between such fingers is also at a preselected location to facilitate the application of the sheet to the stretched valve flap 14.

The fold-over or flip-over arms are illustrated as at 48 and are pivotally mounted upon a suitable pivot pin 49. They are actuated preferably by a rack and pinion device to be described more fully hereinafter.

When the sleeve ram 44 has reached a preselected point in its downward travel, for example, its lowermost point, as shown in Fig. 8, the flip-over arms are actuated and the supplementary sheet 43 is folded along the above-mentioned line extending between the gripper fingers 45. Prior to such folding over, the leading marginal edge of the supplementary sheet 43 is inserted behind the valve flap 14, as in Fig. 9.

In the event that it is desired to apply to the valve a supplementary sheet, as shown at 50 in Fig. 7a, which sheet is to form an inwardly protruding valve flap extension sheet, it is not necessary to fold same over the valve flap, as shown in Fig. 9, and the action of the fold-over arms is omitted by rendering same inactive, as will appear more fully below.

The conformation and functions of the supplementary sheets 43 and 50 will also be described hereinafter.

After the supplementary sheet 43 has been applied, as in Fig. 8, the gripper fingers 45 are released and the sleeve ram 44 is withdrawn. In order to avoid the tendency for the ram to unseat the supplementary sheet during ram withdrawal, suitable sheet hold-down means are provided and actuated in suitable timed relationship with the apparatus to urge the folded sheet 43 downwardly upon the valve flap extension 14a, as shown in Fig. 9. Such hold-down means comprise, in the form shown, a pair of fingers 51 which are jointly secured to a pivot rod 52

for angular movement therewith as will appear more fully herebelow.

The area along the fold line of the supplementary sheet (Fig. 9) is thus thrust downwardly so that it is urged against the upper edge of the valve flap extension 14a. This edge constitutes the innermost edge of the valve when the latter is finally formed but in station No. 3 (Fig. 9) such edge is the uppermost portion of the valve and is easily accessible for the above purpose.

When the sleeve ram 44 has been withdrawn to the extent shown in Fig. 9, that is, when it has been moved out of contact with the supplementary sheet, the hold-down fingers 51 are quickly withdrawn.

The timing mechanism for controlling the sleeve device is so adjusted that the sleeve grippers 45 on the ram 44 are released a fraction of a second before the engagement of the hold-down fingers 51 with the folded sleeve, whereby the latter is freed so that it can be urged downwardly along the fold line thereof upon the upper edge of the valve flap extension 14a.

Thereafter and preferably at the same station, namely, No. 3, the sleeved valve corner is closed by means of a tucking blade, as shown in Figs. 9-12, inclusive, which blade engages the sleeve and valve along a so-called median line which corresponds to the above-described line 14e, the center fold line of the valve flap.

Such a tucking blade is illustrated in Fig. 9 at 53 and is constituted by a member adapted for both angular and linear movement by virtue of a rack and pinion 54. The latter is constituted by a stationary rack 55 having associated therewith a pinion 56 to which is secured the tucking blade 53. By urging the pinion 56 toward the bag tube, as viewed in Fig. 9, such angular and linear movement of the blade is effected.

The hold-down fingers 51 are withdrawn preferably shortly after the tucking blade 53 has engaged the sleeve and is about half way over its range of angular movement toward a final tucked position.

The butterfly 20 can be closed concurrently with the inward tucking of the valve and sleeve by the blade 53. However, it has been found desirable to time the movement of said blade and butterfly such that the tucking blade reaches substantially its final angular position, wherein the valve and its sleeve are at least partially closed, before the butterfly begins to close. The tucking blade 53 preferably remains in its extreme angular tucking position until the butterflies are closed, whereby such blade provides a rigid form over which the final closing of the valve is effected.

It may be desirable to restrict the extent of closing movement of the butterflies so that they remain partially open when in their closest position, for example, to an extent of 10° to 20°, to facilitate the withdrawal of the tucking blade 53. However, this is not absolutely necessary inasmuch as the tucking blade may be withdrawn when the butterflies are fully closed without any ill effect upon the position of the sleeve.

The fly sticks thereafter are shifted to move the bag tube to a release station (station No. 5), whereupon the fly sticks or bag clamps are opened. The butterflies may be slightly angularly opened at station No. 5 to permit easy removal of the valve bag tube. The bag tube thereupon is grasped by a suitable discharge con-

veyor and moved past a final corner presser element which, for example, comprises a suitable rotating segment of a cylinder which moves in timed relationship with the discharge conveyor and gives a final pressing action to the now completed but unsewn sleeved valve. The discharge conveyor moves the bag tubes to a dual sewing machine (Fig. 20) which can sew one or both ends thereof and simultaneously apply a closure tape in a well known manner.

A detailed description of the apparatus will now be set forth.

Feeder and precreaser mechanism

Referring now to Figs. 13-17, inclusive, the feeder mechanism, in the form shown, comprises a device for conveying the flattened bag tubes to the above-mentioned precreaser device and thence to the tube carrier or fly stick mechanism, as shown in Figs. 13 and 21. The latter mechanism advances the bags to the various stations, as described in connection with Figs. 1-12.

A plurality of shallow piles of bags, as at 60, are arranged in overlapping relationship, as shown in Fig. 13a, and rest upon a pair of endless belts, one of which is indicated at 61, one belt being positioned adjacent each of the extremities of the bag piles and suitable rigid supporting means (not shown) being provided intermediate such endless belts. The belts 61, mounted in a conventional manner upon suitable pulleys as at 62, urge the piles of bags against a microswitch 63 having an upstanding lever 64. The latter controls a mechanism for moving the bags individually and successively to the main bag conveyor chains 23 upon which are mounted the above-described grippers 22.

Such mechanism can comprise, for example, a reciprocating suction device having a plurality of suction cups, one of which is shown as at 65, which pick up one bag at a time and urge same in between a pair of short endless belts as at 66 and 67 which are mounted upon suitable pulleys and which are constructed and arranged so that the adjacent "runs" thereof are normally in contact and, therefore, adapted positively for moving each bag individually to the point where it is grasped by a pair of said grippers 22 on parallel endless chains 23, one gripper being located near each extremity of the bag.

In Fig. 13b, the short endless belts 66 and 67 grasp each bag tube and move it to a point as at 68 where a pair of the grippers 22 grasp it, the grippers being actuated in a well known manner by suitable cams. In the form shown in Fig. 13b, the bias scoring of the valve corner to form lines 15 is effected by a rotary scoring roller device as opposed to the reciprocating precreasing device shown in Figs. 14, 16 and 17. In Fig. 13b each tube is fed between rollers 69 and 70. The former is provided with a scoring blade 69a which cooperates with a groove 70a in roller 70 to form said bias score lines 15 as the tubes are moved therebetween.

In the form shown in Fig. 13, the short endless belts 66, 67 may be employed for urging a bag tube, as at 10, against limit stops 71 and 72 so that the leading edge thereof is positioned as at 73, in proper alignment for precreasing by the reciprocating type of precreaser shown in Fig. 14. When the latter type of precreaser has creased the valve corner as at 15 (Fig. 15), the limit stops 71, 72 are lowered out of the path of the bag by a suitable cam arrangement (not shown) and the grippers 22 thereupon are actu-

ated in proper timed relation to grasp the bag tube and move it toward the fly sticks.

The precreeaser shown in Figs. 14, 16 and 17 is intermittently moved into creasing relationship with the bag tube by a cam device. The precreeaser consists of the above-mentioned creasing blade 17 which is mounted for angular movement within narrow limits upon an arm 74. The latter is pivotally associated with an adjustable bed plate 75 by means of a pivot pin 76. The arm 74 is urged upwardly by means of a spring 77 against an adjustable limit stop 78 which may comprise a threaded bolt 79 which passes through a threaded recess in a bolt support 80. The creaser blade 17 acts in conjunction with the above-described grooved base plate 19 bearing the groove 18.

The adjustable bed plate 75 (Figs. 13 and 14) is, of course, disposed in such a manner that the precreeasing or scoring blade 17 makes an angle of 45° with the path of movement of the bag tubes. In order to adjust the position of the precreeaser to accommodate bags of varying sizes, the precreeaser bed plate 75 is mounted for movement transverse to such path of bag movement in the direction of the arrow 81 (Fig. 14). For this purpose the bed plate is associated with a transversely extending supporting arm 82 having slots therein as at 83. Suitable bolts as at 84 (Fig. 16) pass through the slots 83 and engage threaded bores in the base plate 75. By loosening the bolts 84, the precreeaser bed plate 75 can be transversely adjusted as desired.

The arm 74 is moved downwardly intermittently to crease the bag tubes as they move successively into position by means, for example, of a rotating cam 85 which is positioned for cooperation with a roller 86 secured to the arm 74. The cam 85 is secured to a cam shaft 87 extending transversely across the apparatus and operatively connected to a power source by means, for example, of a gear 87a and a suitable driving chain which in turn is connected to a main power source as will be discussed in connection with Fig. 20.

Suitable guides or shoes (not shown), or any other suitable means, can be employed for guiding the bag tubes into position for precreeasing, as shown in Fig. 13.

After each bag tube has been precreeased as above set forth, the grippers 22 grasp same and move each one to the right, as viewed in Fig. 13, whereupon the leading gusset of each bag comes in contact with gusset wedge 21, as in Fig. 2, and is spread. The endless chains 23 are each stretched between a conventional pair of pulleys, one of each pair being shown at 23a, 23b, and are driven at a uniform speed by the main power source and operatively connected thereto as will appear below.

The bags are moved from the precreeasing position, wherein the leading edge is located at 73 (Fig. 13), to a position as shown at the right-hand portion of this figure, wherein the leading edge is located at 88, at which position the butterfly 20 is inserted into the gusset at the valve corner of the tube, and each end of the tube is within an open pair of fly sticks.

It is important for the bag to be properly aligned or positioned relative to the fly sticks and the butterfly 20 in order for a bag valve to be accurately formed and to this end there are provided: (a) a pair of limit stops, one near each extremity of the leading tube edge as at 88a, (b) means for urging each tube against such

stops, and (c) a transverse aligner for shifting the tube to a desired position transversely of its direction of movement while aligned against the bag stops.

Such limit stops are also referred to as bag stops and are adjustable in a direction parallel to the path of the tubes by means of a handwheel 89 which is operatively associated therewith by any suitable means, for example, by rack and pinion devices as at 90, 91.

It is desirable resiliently to urge each oncoming tube against the bag stops 88 by means which are separate from the bag tube grippers 22. Before the leading edge of a bag tube reaches position 88 (Fig. 13), the grippers, by automatic cam control means, are opened and thus disengaged. In order to eliminate any possibility of misalignment of a bag, a so-called edge aligning device or edge aligner is employed, as shown in Fig. 13 at 92 and in detail in Figs. 18 and 19. The edge aligner is constructed and arranged for moving up behind an oncoming bag, urging it against the bag stops, and thereafter retracting below the path of the next oncoming bag, whereupon the operation is repeated in proper timed relation with the other oncoming bags. An example of such an aligner comprises a pair of parallel pivoted arms 92a which are held in spaced relationship at one pair of adjacent extremities thereof by means of a rod 93, and at the opposite adjacent extremities are pivotally mounted as at 94. Secured to one of the arms 92a is a roller lever 95 having a roller 96 mounted thereupon for engagement with a cam 97 which when rotated causes the arms 92 to shift angularly, whereby the upper extremities thereof move a flat pusher element 98. The pusher element 98 is pivotally mounted upon the rod 93 and is moved into a vertical position, as shown in Fig. 18, by means of an arm 99 which in turn is pivotally secured to a stationary plate as at 100 at one extremity thereof and at the other extremity is pivotally associated with a bracket 101 as at 102, the pusher element 98 being secured to said bracket.

The cam 97 is operatively connected to the main power drive by suitable means, a portion of this operative interconnection comprising the bevel gears 103 and a drive shaft 104.

The edge aligner 92 as a unit may be shifted back and forth in a direction parallel to the path of the bag tubes by any suitable means to adjust the position of same relative to the bag stops 88 in order to accommodate bag tubes of varying widths.

In addition to the above-described tube positioning means, a transverse bag tube aligner is provided, one element of which is shown at 105 (Fig. 13), which is movable back and forth in reciprocal fashion under the influence, for example, of a cam, as will be described hereinafter, the movement being in timed relationship with the bag advancing means and with the fly sticks, whereby each bag tube is accurately positioned transversely of its direction of motion further to insure the proper positioning of the valve corner spreading means, such as the butterfly 20 relative to the valve corner. After the bag tube is properly positioned by the above means, the fly sticks are closed and the bag tube advanced to the next station.

The station in which the bag tube 10 is located, as in Fig. 3, and in the right-hand portion of Fig. 13, is known as the "feeding station" and also is designated as station No. 1.

Driving mechanism (Fig. 20)

The apparatus is driven by a power source, such as an electric motor 106, which is operatively connected to sewing heads 107, 108, for sewing the ends of the valved bags, as by belts 109 which are stretched over suitable pulleys mounted on driving and driven shafts. Motor 106 may be of a variable speed alternating current type.

The tube carrier including the fly sticks, which have been briefly described above and which are shown generally in Figs. 20, 21 and partially in Figs. 3-6, comprises a rotary hollow tube or spindle 110 having a pair of disks mounted for rotation thereupon at 111 and 112 to each of which there are secured a plurality of pairs of the bag clamps or fly sticks, for example, eight pairs, as shown in Fig. 21. A typical pair of fly sticks is indicated as at 113 (Fig. 21) and is constituted by individual fly sticks 114 and 115, the former of which is preferably movably mounted for angular movement about a pivot 116, and the latter of which is fixed relative to said pivot and to its supporting disk 112.

The disks 111 and 112 are secured to the rotary spindle 110 for angular movement therewith. The latter is intermittently angularly moved through increments, for example, of 45°, by any suitable means, including a Geneva mechanism, as indicated generally at 117 (Figs. 20 and 27) which is driven by said motor 106.

Referring again to Fig. 20, the operative interconnection between the main power source, namely, the electric motor 106 and the rotary hollow spindle 110, includes the above-mentioned Geneva mechanism 117 and also a variable speed control unit 118 which is preferably interposed between the Geneva mechanism and the motor 106. The variable speed control unit 118, for example, is of the type known in the art as a "P. I. V." drive. The terms P. I. V. normally refer to the characteristics of this unit, namely, positive drive with infinite variations. Speed control unit 118 is interposed in this interconnection for the purpose of adjusting the output speed of the valver and sleeve device with the sewing machine in order to obtain a minimum distance between bags. The sewing machines 107 and 108 preferably are of the type which apply a closure tape across the sewn ends of the bags and such tape is applied in a continuous manner such that even though no bag tube is undergoing sewing the closure tape is applied to the sewing machine. Thus the adjacent ends of successive of the bags after sewing are normally interconnected by the closure tape. By adjusting the output speed of the valver and sleeve with respect to the sewing machine a minimum distance between successive bags can be obtained and there can be avoided the stitching of unnecessarily long lengths of tape between the bags. In normal operation, the adjustment of the variable speed control unit 118 is made first in order to obtain such minimum spacing between the tubes and thereafter the main drive motor 106 can be adjusted to a desired speed by a suitable speed control device as at 119 whereby the overall output of the apparatus is adjusted as desired.

The gearing for interconnecting the motor 106 with the Geneva mechanism 117 and the rotary spindle 110 comprises, in the form shown, a pair of bevel gears 120, 121, respectively, upon a motor shaft 122 and an intermediate shaft 123, the

latter being connected to an input shaft 124 of the P. I. V. unit 118 by means of bevel gears 125 and 126. An output shaft 127 of the speed control unit 118 is in driving connection with a Geneva arm 128 (driving arm) of said mechanism 117 by means of a reduction gear train 129 including a relatively small gear 130 which drives a larger gear 131 rigidly secured to shaft 132. Secured to the latter is another relatively small gear 133 which drives a larger gear 134. The latter gear is fixed to a shaft 135 upon which said Geneva arm 128 is rigidly secured.

The Geneva mechanism 117 is of a conventional type and includes a so-called slotted four point Geneva gear 136 which is adapted for cooperation in a well known way with the Geneva arm element 128 whereby the Geneva gear 136 is angularly shifted step-by-step through 90° for each revolution of the Geneva arm 128. Arm 128, as shown in Fig. 27, is accompanied by a disk portion 128a, partially cut away as at 128b. The periphery of disk portion 128a is adapted to have engagement with arcuate portions as at 136a on the Geneva gear 136 to lock the latter against rotation during intervals when the arm 128 is not acting in the slots of the Geneva gear 136 to advance same. As above mentioned, it is desired to shift the rotary hollow spindle 110, together with the fly sticks thereupon step-by-step, through 45° in order to move each bag tube held thereby from one station to the next. Thus it is necessary to employ a two-to-one gear interconnection between the Geneva gear 136 and the spindle 110. Such an interconnection comprises a gear 137 which is rotatable with the Geneva gear 136 upon a common shaft 138, gear 137 being in mesh with a gear 138 which is rigidly secured to the spindle 110. The latter gear is provided with double the number of teeth of the gear 137.

It has been found convenient and desirable to transmit the power for actuating the valve forming and the supplementary sheet forming and applying devices by means of a shaft 139 which extends centrally through the hollow spindle 110 and is co-axial therewith. The shaft is indicated, for example, in Figs. 20, 21, 22, 27, 28, 29, 31 and 32. The rotary spindle 110 is mounted in suitable bearings as at 140 (Fig. 29) and the co-axial shaft 139 may be mounted in bearings as at 141. The shaft 139 is also referred to as the main cam shaft and is connected directly to the variable speed control unit 118 by means of a gear train, a portion of which is described above, and which includes a spur gear 142 (Fig. 20) which meshes with said gear 134.

The main cam shaft 139 is operatively connected to a mechanism for operating the above-described tucking blade 53 and the hold-down fingers 51 by means which are partially illustrated in Fig. 20 and which will be described more fully hereinafter. The means partially shown in Fig. 20 include a sprocket wheel 143 which is driven by the main cam shaft 139 by means of bevel gears 144, 145 which respectively are mounted upon said main cam shaft and upon a shaft 146 to which is fixed said sprocket wheel 143. In order to adjust jointly the phase relationship of the motion of tucking blade 53 and the hold-down fingers 51 relative to the bag tube in station No. 3, a differential 147 is interposed in the shaft 146, said differential being adjustable in a well known way by means of a manually controlled knob as at 148. The adjustment of the differential 147 can, of course, be made while the ap-

paratus is in operation, thereby eliminating the necessity for arresting the machine to make adjustments of these elements by a trial and error method.

The mechanism for reciprocating the sheet ram or sleeve ram 44 and for driving the supplementary sheet forming device (to be described later) have power transmitted thereto by means of an operative interconnection with the main cam shaft 139, portions of which also are shown in Fig. 20 comprising a shaft 149 upon which is mounted a sprocket 150, said shaft 149 being driven by means of a bevel gear 151 which meshes with said bevel gear 144. A differential 152 is also interposed in the shaft 149 for adjusting the phase relationship of said sheet forming device and the ram 44 relative to a bag tube in station No. 3. The differential 152 can be manually adjusted by means of a knob 153.

The transverse bag tube aligner element 105 (Fig. 13) is reciprocated under the influence of a cam 154 which is fixed upon a shaft 155 and driven by main cam shaft 139 by means of bevel gears 156. A roller 157 is secured to the aligner element 105 and engages the cam 154, there being suitable supporting means for the element 105, as shown in Figs. 29 and 35. Yielding means such as a spring 158 (Fig. 29) are employed for urging the roller 157 against the cam 154.

The reciprocative movement of the shaft 29 which supports the umbrella element 25 and the valve press ram 28 is governed by a cam 159 which preferably also is mounted upon the shaft 155 for rotation therewith. The interconnection between cam 159 and shaft 29 will be described later.

The spreading and closing of the butterflies 20 is effected, for example, by means of a butterfly shuttle cam 160 which is angularly shiftable under the influence of a secondary butterfly cam 161 as will also be described more fully hereafter. The latter cam is mounted for rotation upon the main cam shaft 139.

Tube carrier (fly stick elements) and control means therefor

The tube carrier, including the fly sticks, has been described briefly above and comprises said hollow spindle 110, the fly stick support disks 111 and 112 on spindle 110, and eight pairs of fly sticks mounted at equal intervals upon each support disk. Each pair of fly sticks upon one of the disks is mounted in a preselected aligned relationship with a corresponding pair of fly sticks upon the other support disk in such a manner that when a bag tube is held by such corresponding pairs of fly sticks, it is substantially in the position of a paddle on a paddle wheel, that is, it extends in a flat plane radially from the spindle 110.

The support disks 111 and 112 can be shifted axially upon the spindle 110 in order to accommodate bag tubes of varying sizes.

The opening and closing of the fly sticks is controlled by means of a pair of shuttle cams 162 and 163 which are associated with the fly sticks upon the disks 111 and 112, respectively.

The support disk 112 and its associated shuttle cam 163 are shown in detail in Fig. 21. The co-operative action of said shuttle cam with the fly sticks on disk 112 will now be described. The pair of fly sticks 113 in this figure are shown in the open position with a bag tube 10 positioned therebetween immediately prior to the clamping of the tube. The shuttle cam 163 is operated in

timed relationship with the Geneva mechanism 117 in such a way that the shuttle cam 163 is held stationary when the rotary spindle 110 is being angularly shifted by the Geneva mechanism. Of course, when the rotary spindle is so angularly shifted, the support disks 111 and 112 and their related fly sticks are also angularly shifted. However, when said support disks are held stationary, that is, when the Geneva mechanism 117 is "on dwell," the shuttle cams 162 and 163 are angularly shifted a preselected amount, by means to be described later, in order to close the fly sticks in station No. 1. The shape of the shuttle cam 163 is such that the fly sticks when in station No. 5 are automatically opened prior to the angular shifting of the shuttle cam 163, such opening of station No. 5 being effective to release the bag tube.

As above described, each pair of fly sticks, such as 113, is provided with a stick 115 which is fixed relative to the support disk 112 and another stick 114 which is pivotally mounted as at 116. Suitable resilient means such as spring 113a (Fig. 23) are provided for urging each pair of fly sticks to a closed condition. The stick 114 is movable pivotally about pivot 116 by means of an arm 114a having a roller 114b thereon which cooperates with the periphery of the shuttle cam 163.

The shuttle cam 163 is in the position shown in Fig. 21 when the fly sticks, after being angularly shifted through 45° by means of the Geneva mechanism 117, arrive in the position shown whereby said roller 114b rides from a high portion of said shuttle cam over a crest thereof, as at 163a, and partially down an inclined or "fall" portion 163b whereupon the fly sticks moving into station No. 1 are partially closed with respect to their condition in the previous station No. 8. However, the fly sticks are sufficiently spread in station No. 1 to receive a bag tube. After a bag tube has been moved into the spread fly sticks at station No. 1, the shuttle cam 163 is angularly shifted by a preselected amount in order to cause the roller 114b to move down upon a low portion of the cam as at 163c whereby the fly sticks are closed and the bag tube is firmly held for intermittent movement to the various valving and supplementary sheet applying stations. Such angular shifting of shuttle cam 163 is preferably accomplished by means of a secondary cam 164 through the intermediary of a shuttle cam arm 165. The latter is pivotally associated at 166 with the shuttle cam 163 and at the opposite extremity is provided with a bifurcated portion having fingers 165a and 165b between which extends a cam shaft 167 mounting said cam 164. The shaft 167 mounts a slide block 168 which is slidably associated with and between the fingers 165a and 165b, said shaft 167 being rotatable while said block is prevented from rotation by fingers 165a, 165b. Motion is communicated to the arm 165 from the secondary cam 164 by means of a roller 169 which is mounted upon a suitable arm 170 secured between the tips of the fingers 165a and 165b. Suitable resilient means are provided for urging the roller or cam follower 169 into engagement with the secondary cam 164.

The cam shaft 167 and thus cam 164 are continuously driven by means of a direct connection with the variable speed control unit 119 (Fig. 20) by means of gears 171 and 172, the latter meshing with the gear 142.

An analogous secondary cam for the shuttle cam 162 is provided as at 173 and is mounted for rotation upon shaft 167. Angular shifting of the

shuttle cam 162 by cam 173 is effected by means of a shuttle cam arm 174 which is analogous to the arm 165.

The secondary cams 164 and 173 also can be shifted axially upon the shaft 167 in order to follow any desired axial adjustments of their respective shuttle cams.

The extent of angular movement in one direction of the shuttle cams 162 and 163 under the influence of their secondary cams is approximately 10°. It will be understood that such shifting of the shuttle cams is made in carefully timed relationship with the motion of the rotary spindle 110 and the fly sticks supported thereupon.

When a pair of fly sticks moves into position in station No. 1, as shown in Fig. 21, shuttle cam 163 is initially in the position shown in this figure. Immediately after a bag is positioned within the open fly sticks in station No. 1, the shuttle cam 163 is angularly shifted, e. g. 10° counterclockwise, under the influence of cam 164 whereby the fly sticks in said station are closed. Immediately the Geneva mechanism 117 advances the fly sticks through 45° whereby the bag tube formerly in station No. 1 is advanced to station No. 2. During such 45° advance, and before another pair of fly sticks reaches station No. 1, the cam 163 is shifted, e. g., 10° clockwise to its original position. Thus the angular movement of cam 163 is oscillatory.

The shuttle cam 163 preferably is provided with a slot as at 163d for the reception of the rollers 114b. Such slot extends clockwise substantially between stations Nos. 1 and 4 and is about 120° in extent. Slot 163d provides a positive means for preventing the fly sticks from opening during the valving of and the application of a supplementary sheet to a bag tube.

Thus, the shuttle cam 163 is in the position shown in Fig. 21 at the time the fly sticks come to rest after being moved by the Geneva mechanism 117. Shortly thereafter a bag tube is moved between the fly sticks at station No. 1 and said shuttle cam is angularly shifted to the position shown in Fig. 24 whereupon the roller 114b moves to the position shown in the latter figure relative to cam 163 and the fly sticks are thereby closed. While the supporting disks for the fly sticks are stationary, and thus the bag tubes held thereby are also stationary, the valving and supplementary sheet application takes place as will be described hereinafter.

When the fly sticks are shifted through 45° by the Geneva mechanism, it will be seen that the pair of fly sticks in station No. 4 (Fig. 21) will be shifted to station No. 5, during which angular movement the shuttle cam follower roller of this particular pair of sticks will move out of the groove 163d, thereby freeing the fly sticks for opening under the influence of the next successive "rise" portion of the shuttle cam in a clockwise direction as at 163e. Said shuttle cam follower roller, when the fly sticks are moved to station No. 5, will ride upon the cam surface 163e whereby the fly sticks are opened for release of the bag tube in station No. 5. In the form shown, the the fly sticks are maintained in an open condition in stations Nos. 6, 7 and 8. In station No. 8, said sticks are in their most widely extended condition for the purpose of facilitating the movement of the next oncoming bag tube in between the fly sticks. That is, the fly stick 114 in station No. 8 must be moved in a clockwise direction above the path (Fig. 21) of the on-

coming bag tubes, during the movement thereof into station No. 1, in sufficient time to avoid the next oncoming bag tube from being thrust on top of the stick 114. In order to speed up the positioning of such oncoming tube in a properly aligned position between the fly sticks of station No. 1, such tube should be moved toward the pivot of a pair of fly sticks during movement of the latter into station No. 1 from station No. 8. Consequently before the fly sticks are arrested in their angular motion about the axis of spindle 110, when proceeding from station No. 8 to station No. 1, a bag tube is interposed therebetween and is substantially in its desired aligned position when the pair of fly sticks come to rest in station No. 1.

It will be understood that the angular shifting of the shuttle cam 163 is in the nature of a periodic oscillation wherein such cam commences the oscillation when in a preselected angular reference position, is shifted to close the sticks in station No. 1, whereupon the entire fly stick assembly or tube carrier is shifted 45° during which time the shuttle cam is returned to said preselected angular reference position so that when the next succeeding pair of fly sticks is shifted from station No. 8 into station No. 1, the cam follower mechanism 114a, 114b will encounter precisely the same portions of the shuttle cam 163 as were encountered by the pair of fly sticks next ahead when the latter were moved into station No. 1.

Certain details of the hub or center support of fly sticks 114 and 115 are shown in Fig. 24. Preferably said sticks are of light material, such as wood, which are secured within hub supports 114c and 115a, respectively. Said hub supports comprise suitable metal members, the form of which is pivotable by means of pivot rod 116, and the latter of which is rigidly secured to a supporting disk such as 112. It is understood that the pivot rod 116 is supported in suitable bearings which preferably are mounted in hub portion 115a. The latter is secured to a support disk as 112. In the form shown, the hub support 115a is removably mounted upon support disk 112 as shown in Fig. 23 by means of a radially inwardly extending bracket 115b which is secured to the disk 112 as by bolts 112a.

Each of the fly sticks 114, 115 (Fig. 24) are removably secured to their respective hub portions by means, for example, of set screws 175.

The gusset of each tube is slightly spread by the gusset wedge 21, as shown in Figs. 2 and 25, in such a manner that the butterfly 20 in station No. 1 moves into the gusset easily and without crumpling same. In order further to assist in holding the spread gusset in proper position for the insertion of a butterfly, despite the number of plies of which the bag tube may be composed, and also in order to insure a positive gripping of the bag tube at an area adjacent the fly stick pivot 116, a yieldably mounted grip member 176 is provided upon the fly stick hub member 114c. The grip member 176 is urged downwardly as viewed in Fig. 24 against suitable limit stops (not shown) and toward the inner face of the fly stick hub member 115a. Said grip member is so urged by means, for example, of coil springs 177 which may be mounted in suitable recesses as at 178 formed in the hub member 114c and the grip member 176. Thus each pair of fly sticks can accommodate a bag tube of varying numbers of plies and the gussets of such bags will be properly aligned for insertion of a butterfly 20.

Referring now to Figs. 21, 23, 24 and 29, the bag corner spreader means will be described which, in the form shown, is constituted by the above-mentioned butterfly 20, there being one butterfly associated with each bag clamp.

Each butterfly 20 includes a pair of wings 20a, 20b (Fig. 24). Such wings are mounted for being spread to the position shown in Fig. 4 by means herein described. Butterfly wing 20a is secured to a small bracket 179 having a collar which in turn embraces and is adjustably secured to a sleeve shaft 180, the latter being mounted for angular movement in a bearing 181. The angular position of the bracket 179 can be adjusted relative to the shaft 180, for example, by adjustment of a bolt 182. Secured to one extremity of said shaft 180 is a bevel gear 183 which is in mesh with a center bevel gear 184 secured to a rock shaft 185, the latter being mounted in suitable bearings as at 186 which are secured to the support disk 112 via said member 115b.

The other wing 20b of the butterfly 20 is secured to a collar member 187. The latter in turn embraces a shaft 188 which is co-axial with and extends through the hollow shaft 180 which acts as a bearing for the lefthand extremity of shaft 188 as viewed in Fig. 23. Collar 187 is adjustably mounted upon shaft 188 as is collar 179 upon shaft 180. The righthand extremity of said shaft 188 is secured to a co-axial bevel gear 189 having a sleeve portion 190 which is journaled in a bearing 191. The bearings 181 and 191 are secured to the hub member 115b and hence to the support disk 112 for movement therewith.

The center bevel gear 184 in addition to meshing with the gear 183 also meshes with bevel gear 189. Consequently by angularly shifting or rocking the shaft 185 the butterfly wings 20a and 20b can be opened or closed.

Referring again to Figs. 23 and 24, the outer extremity of the rock shaft 185 carries a roller arm 192 having secured at the extremity thereof a roller 193. The roller arm 192 is provided with an adjustable collar member 192a for embracing the shaft 185 and thus said roller arm can be positioned at any desired angular relation to the shaft 185.

It will be understood that each of the butterfly operating mechanisms includes a roller arm 192 and a roller 193. These rollers, as best shown in Fig. 21, at certain angular positions about the axis of spindle 110 are adapted for engaging the edge of the butterfly shuttle cam 160 (Figs. 20, 21) above described which is adjustably mounted with respect to a frame part of the machine in a manner later described, the butterfly shuttle cam 160 being suitably shiftable by means also later described, and being shaped to cause the butterflies to be moved to open and closed positions with the proper timing as hereinabove explained with respect to Figs. 3-12, inclusive.

As shown in Fig. 24, the wings of each butterfly may normally be yieldably held in a closed position pressed against one another, as by a spring 194 having one end thereof secured as at 195 to an arm 195 which is held stationary with respect to the mounting for the butterfly, and the other extremity of which is secured as at 197 to an arm 198 having a collar 199 which embraces and is adjustably clamped upon the shaft 185.

The butterfly shuttle cam 160 which controls the rocking (opening and closing) of the butterflies is mounted for angular movement about the

rotary spindle 110. The extent of such angular movement in the form shown is quite limited, amounting normally not in excess of 30°.

Said shuttle cam 160 is provided with a gear segment portion 160a which meshes with a sector gear 200 fixed upon a rock shaft 201. As shown in Fig. 20, the rock shaft 201 is under the influence of the secondary butterfly control cam 161 through the intermediary of a cam follower arm 202 fixed to said shaft 201 and having a roller 203 which engages a groove 161a formed in the cam 161. As above explained, the secondary butterfly control cam 161 rotates with and is secured upon the main cam shaft 139. Cam 161 is so shaped that by its engagement with roller 203 shaft 201 and sector gear 200 are caused to rock and angularly to shift cam 160 as required to cause actuation of the butterflies with proper timing.

As shown in Fig. 21, the cam 160 is so shaped that the butterfly wings in station No. 1 are closed. When such butterfly is shifted to station No. 2, in the modification of the apparatus described, the butterfly remains closed until after station No. 2 has been reached, whereupon said cam 160 is angularly shifted in a counterclockwise direction (Fig. 21) whereby the roller 193 in this station rides up onto the dwell portion 160b of the cam 160 so that the wings of the butterfly will be rocked to a spread-apart position. As also shown in Fig. 21, another pair of the butterfly wings at station No. 3 are also in a spread-apart position for a portion of the time that the butterfly is in this station. However, when the above-mentioned angular shifting of the shuttle cam 160 occurs, the butterfly wings in station No. 3 are closed. The latter occurs after the application of a supplementary sheet as described generally in connection with Figs. 7-9 whereupon such butterfly closing movement occurs as shown in Fig. 11 in timed relationship with the inward tucking of the valve and supplementary sheet by means of the tucking blade 53.

Such closing of the butterfly in station No. 3, of course, is the result of the roller 193 in this station rolling off of the dwell 160b which occurs when cam 160 is rocked counterclockwise after the arrival of the butterfly in station No. 3.

The butterfly, after being so closed in station No. 3, remains closed during movement into and through stations Nos. 4 and 5. However, if desired the butterfly may be slightly opened in station No. 5 in order to facilitate the release of the bag, it being borne in mind that the butterfly wings clasp a portion of the bag valve when they are in a closed position. Such slight opening of each butterfly in station No. 5 can be effected by means of a small dwell portion 160c. After passing station No. 5 and after the bag tube is released, the butterfly wings are again closed because the respective rollers 193 roll off of said dwell portion 160c and the wings remain closed until they again reach station No. 2.

Although the cam mechanism for controlling the butterflies, as above described, first opens each butterfly at station No. 2 whereby the valve corner is spread, it is possible to spread a butterfly at some point intermediate stations Nos. 1 and 2 by changing the conformation or location of the dwell portion 160b.

Valve flap spreading and pressing means

In order to make a satisfactory valve in a bag tube, it is desirable:

- (1) To align each bag tube in its respective

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bag clamp or fly sticks. This is accomplished by the lateral and longitudinal bag aligning means.

(2) Thereafter the valve flap should be pressed adjacent the line 14d for example, by the above described press ram 28, with the assistance of the tube end spreading means, namely, the umbrella element and its arms which latter stretch substantially taut the valve flap. Proper coaction of the umbrella arms and the valve press ram will align the gusset center fold line 14e on the valve flap 14, with the radially extending line between the closed fly sticks. That is, such center fold line 14e will be positioned perpendicular to the base fold line 14d. It is also perpendicular to the line comprising the upper edge of the valve flap as viewed in Figs. 4, 5 or 6.

Referring now to Figs. 5, 5a, 5b, 5c, 5d, 5e, 6 and 6a and also to Figs. 20 and 37, the means will now be described for controlling the reciprocative motion of the plunger 29 which supports the umbrella ram element 25 and the valve press ram 28.

The reciprocative plunger 29 is mounted in a suitable bearing 29a (Fig. 37), said plunger being preferably of rectangular cross-section and having a toothed flat lower surface 29b which comprises a rack portion for cooperation with a pinion 204. The pinion 204 is intermittently angularly shifted to move the plunger 29 in proper timed relation towards and away from a bag tube in station No. 2 by means of the above-described cam 159 (Figs. 20 and 37) having formed therein a groove 159a into which fits a roller 205 which is mounted upon an arm 206. The latter is drivably associated with a sector gear 207 by means of a shaft 208. The sector gear 207 when shifted under the influence of rotating cam 159 angularly shifts the pinion 204 back and forth through the intermediary of a small pinion 209 which is fixed upon a common shaft 209a with the pinion 204.

The groove 159a of the cam 159 is so shaped to accomplish a proper timed reciprocative motion of the plunger 29 whereby the open tube end is first stretched taut by umbrella element 25 and the valve flap is pressed along line 14d by the press ram 28 as described above in connection with Figs. 5b, 5c and 5d. The cam 159 is continuously rotated because of its interconnection with the main cam shaft 139 via bevel gears 156 and shaft 155.

Referring again to Figs. 4, 5, 5a, 5b, 5c and 6, after the butterfly 20 has been spread in station No. 2, as shown in Fig. 5, the umbrella element 25 and the valve press ram 28 are thereafter applied by virtue of the reciprocation of the plunger 29, under the influence of the cam 159 and the segment gear 207.

It is desirable for the umbrella arms 27 to be in their retracted position as shown in solid lines in Fig. 5c, such position being assumed initially and prior to the entry of the flattened wedge-like leading face 23a of the ram 26 into and against the spread tube end. If the umbrella arms 27 were not initially in such retracted position shown in solid lines in Fig. 5c, for example, if they were initially in an aligned position, as shown in broken lines in this figure, at the time that the umbrella element is thrust against the open bag tube end, there would be a strong tendency for one or both of the marginal portions of the outer edges 15 of the tube mouth to be folded inwardly to an undesired position under the action of such initially aligned

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umbrella arms. If this should occur, there would be an improper spreading of the portion of the open tube end adjacent the side edges 14b of the valve flap extension 14a and consequently the valve flap itself would not be properly extended and prepared for the application of valve press ram 28.

After the umbrella element 25 has been thrust into the open end of the bag tube by the reciprocating plunger 29, the arms 27 are snapped or quickly shifted forward to an aligned position, as shown in broken lines in Fig. 5c, this being accomplished under the influence of a micro-switch as shown in Figs. 35 and 36. Such a micro-switch is shown at 37a having an arm 37b which by means of a roller 37c mounted thereon is actuatable by means of a cam 37d. The latter cam is mounted upon the shaft 155 (Fig. 20) which, by means of the cam 159 and other connections, drives the reciprocating plunger 29. The cam 37d, of course, can be angularly adjusted upon the shaft 155 in any desired manner in order to obtain the proper timing of the spreading (opening) and retracting (closing) of the umbrella arms 27.

As viewed in Fig. 5d, the valve flap includes a trapezoidal portion indicated at M, N, O, P. The line M—N constitutes the valve flap base fold line above described at 14d, and the lines N—O and M—P constitute the diagonal fold lines 15. It is the above trapezoidal portion which must be spread and stretched substantially taut preparatory to the application of the valve press ram 28 in order properly to form the sharp crease line along the line 14d.

A failure properly to stretch substantially taut the trapezoidal portion M, N, O, P might result in a wrinkling or crumpling of the portion of the valve flap adjacent the line 14d (M, N) whereby an improper valve will be formed requiring a rejection of the bag tube.

Referring again to Fig. 5d and to Fig. 6, it was explained above that normally the umbrella arms 27 are so positioned relative to the bag tube, by means of the adjustable arm connection 30 (Fig. 5b), that said umbrella arms when snapped forward to aligned position move behind the valve flap extension 14a to the position shown in Fig. 6. If desired, the umbrella arms may be raised slightly relative to the bag tube and relative to the base fold line 14d whereby the arms do not move behind the valve flap extension 14a but assume the position shown in Fig. 5d. Of course, if the umbrella arms do not move behind said valve flap extension, then upon withdrawal of such arms there will be no so-called pulling out of the valve flap whereby there is prevented an undesirable hugging of such flap against the open tube end which, if it occurs, may normally prevent the insertion of a supplementary sheet.

It has been found desirable with relatively heavy bags to make sure that the umbrella arms assume the position shown in Fig. 6 behind the valve flap extension 14a and thus near points P and O (Fig. 5d). With a bag comprising heavy paper or one comprising an unusually large number of plies, it would be desirable to move the umbrella arms downwardly near the points P and O, that is, to lower the umbrella element 25 to insure that the umbrella arms when snapped into alignment are moved behind the valve flap extension 14a and near the points P and O whereby a positive stretching action can be obtained for said trapezoidal portion of the bag valve.

In lieu of the umbrella element 25 and the umbrella arms 27, suitable means can be substituted for stretching the trapezoidal portion of the bag valve. For example, an air jet could be employed for this purpose. However, it is not desirable to use such an air jet in connection with containers for food because foreign matter may be carried into the container by the air jet.

The extent of angular movement of the umbrella arms 27 is normally between about 30° to 45°. This extent of angular movement can be adjusted in response to: (a) the basic weight of the paper or sheet material comprising the bag, and (b) the number of plies of the bag. There is no general rule in order to cover all types of adjustment of this kind but suitable adjustment should be made to produce the most adequate stretching action for each individual type of tube.

Valve flap tucking means

In connection with Fig. 9 above, there was described briefly the tucking blade 53 and its cooperation with an opened tube end after the application of a supplementary sheet as at 43. There also was described generally the operation of the hold-down fingers 51. The operative interconnection between the tucking blade 53, the hold-down fingers 51 and the drive means therefor will now be described.

Reference is made to Figs. 9, 20, 28, 33 and 34. When the spread tube end is moved into station No. 3, a supplementary sheet, as at 43 or 50, may be applied to the bag tube or, if desired, no supplementary sheet at all need be inserted whereupon a valve is formed without any extension or tuck-in sleeve. For ease in understanding the invention, the mechanism will now be described for tucking the valve flap to form a valve after a supplementary sheet, such as a sleeve 43, has been applied, as shown in Fig. 9.

As described in connection with Fig. 20, the operative interconnection between the tucking blade and the hold-down fingers with the main power source is partially shown comprising the shaft 146 which is driven by the main cam shaft 139 through the bevel gears 144 and 145. At the outer extremity of shaft 146 there is secured the sprocket 143 which also is shown in Fig. 28. By means of a sprocket chain 210, the sprocket 143 is operatively connected to a cam shaft 211 (Figs. 28, 33 and 34) on which are mounted suitable cams for controlling the action of said tucking blade 53 and hold-down fingers 51.

A cam, as at 212 (Fig. 34), is provided for governing the motion of the hold-down fingers through the intermediary of a cam follower arm 213 having a slot 213a through which extends the cam shaft 211, said cam follower arm 213 thus being adapted for reciprocating movement relative to the cam shaft 211 by means of a cam follower roller 214 mounted upon the end of arm 213 and urged against cam 212 by means of suitable yielding means, such as a spring 215. The latter is secured at one extremity to the arm 213 and at the other extremity thereof to a suitable fixed mounting. The roller 214 cooperates with the edge of the cam 212, the latter having a profile, as shown in Fig. 33, of such a nature that periodic oscillations of the hold-down fingers 51 are communicated thereto in carefully timed relationship with the tube carrier or fly stick mechanism. Also the movement of the hold-down fingers 51 is carefully timed with respect to the motion of the supplementary sheet applying ram 44 (Figs. 7 and 8) whereby, as explained in

connection with these figures and also in connection with Fig. 9, said fingers are effective to urge a folded-over supplementary sheet, such as sleeve 43, downwardly against the upper edge of the valve flap extension immediately upon the release of the sleeve grippers 45 in order that the supplementary sheet will not be unseated or disarranged during the withdrawal of the supplementary sheet ram 44.

The cam follower arm 213 is operatively connected to the pivot rod 52 of the hold-down fingers by means of a suitable adjustable arm 216 (Fig. 33) which at one end is pivotally associated with the arm 213 and at its other end is provided with a collar for embracing the rod 52. The collar of the arm 216 can be adjustably positioned upon the pivot rod 52 in any well known manner.

Substantially simultaneously with the engagement of the hold-down finger with the folded edge of the sleeve 43, the tucking blade 53 engages the sleeve and pushes same inwardly together with the valve flap 14. The tucking blade is urged against said valve flap 14 (and against a supplementary sheet if applied) along said "median line" of such flap, that is, along the line 14e which, when the valve is formed, extends along the lower edge of the bag valve. An analogous "median line" exists on the supplementary sheet 43 as at 43a.

The combined linear and angular movement of tucking blade 53 is governed by the cam mechanism illustrated in Figs. 28 and 34 comprising a cam 217 having a groove 217a therein of a pre-selected conformation and in which groove there is movable a cam follower roller 218 which is mounted upon an arm 219 pivotally supported at its lower extremity as at 220. Rotation of the shaft 211 consequently will intermittently angularly shift or oscillate the arm 219 under the influence of the cam 217. The upper extremity of the arm 219 is interconnected with the rack and pinion mechanism 54 by means of a linkage 221 (Fig. 33). The latter comprises two links 221a and 221b. The latter is adapted for linear reciprocating motion within a grooved support 222, one extremity of link 221b being provided with a suitable bifurcated portion for embracing a pivot shaft 56a upon which is secured the pinion 56, together with the tucking blade 53. It will be seen that by reciprocating the link 221b to the left and right as viewed in Fig. 33, the tucking blade 53 will be shifted both linearly and angularly toward and away from the bag tube.

The link 221a is pivotally secured both to the link 221b and the arm 219.

Regarding the timing of the motion of the tucking blade 53, it is desirable to time such movement relative to the movement of the butterfly wings in station No. 3 such that the tucking blade reaches substantially its final angular position to the right, as viewed in Fig. 33, wherein the valve and a supplementary sheet are at least partially closed, before the butterfly is started upon its closing angular movement. It will be recalled that the wings of the butterfly are spread to a maximum angle of between 145° and 155°. Consequently, the spread valve flap can undergo considerable tucking action by the tucking blade 53 before it is necessary to commence the closing of the butterfly wings without any danger to the bag corner. The tucking blade 53 preferably remains in its extreme angular tucking position at the righthand extremity of its motion (as shown in broken lines in Fig. 33) until the butterflies

are closed whereby the blade provides a rigid form over which the final closing of the valve can be effected. Thereafter the tucking blade is withdrawn and, if desired, the butterflies may be partially opened to assist in such withdrawal. However, in the form shown, the butterfly wings are not opened for the purpose of facilitating the withdrawal of the tucking blade.

Sleeve forming device

Referring now to Figs. 28 and 33, there is here shown the valve end of a bag as it appears upon arrival at station No. 3 ready to receive a supplemental sheet. It may be briefly explained here that the supplemental sheets are formed and inserted in the following way. A roll of paper 223 or other sheet material of which the supplemental sheets are to be formed, is rotatably mounted upon a suitable bracket structure which may extend from the lower portion of a frame for the device. The paper of this roll is of a width corresponding to the width of the desired supplemental sheet before it is folded in the valve of a bag. The paper from roll 223 is drawn up into a part of the machine indicated generally at 224 (Figs. 28 and 32). This part of the mechanism serves suitably to slit and cut the paper into valve flap or valve sleeve lengths and also applies adhesive along one edge of such lengths, and, if desired, may further perform certain scoring operations. The severed supplemental sheets thus prepared are then taken by the above-described ram 44 under the influence of the gripper fingers 45, and carried down into the valve corner of the bag with the edge of the supplemental sheet bearing adhesive underlying the edge of the valve flap.

The mechanism at 224 for slitting, cutting, scoring, and so forth, of the sleeves will now be described in detail. This part of the mechanism may be carried by a suitable frame structure 225 and is driven by means of a sprocket chain 226 which passes over the above-described sprocket wheel 150 (Figs. 20 and 28) and communicates power thereto by means of another suitable sprocket wheel 227 (Fig. 28).

The sprocket chain 226, as shown in Fig. 28, also passes over a sprocket wheel 228 secured upon a shaft 229. The latter mounts a ram lift cam 230 which is to be described more fully hereinafter.

Any slack in the sprocket chain 226 can be taken up and the tension upon said chain can be governed by means of a suitably mounted idler sprocket wheel 231 which is mounted upon an angularly shiftable segment member 232 pivoted at 232a which can be angularly positioned and there secured in any desired location within preselected limits of angular motion of said segment member.

The frame 225 and the mechanism carried thereby, including the ram mechanism, is so mounted as to be slidably adjustable as a unitary assembly toward and away from the bags operated upon, so as to accommodate bags having different dimensions. Any suitable means (not shown) can be provided for this purpose comprising, for example, a suitable manually adjustable worm drive device. It is understood that as said frame 225 is so shifted slidably toward and away from the bags, the tension upon the sprocket chain 226 may be altered and may be adjusted by suitable positioning of the segment member 232.

In order to understand the reason for certain of the supplemental sheet cutting operations and cutting means to be described below, it is well to consider the particular type of sleeve illustrated in Figs. 7-12, inclusive. The supplemental sheet 43, as shown for example in Fig. 12, is of the type above explained from which there is formed what is known in the art as a tuck-in valve. The latter is, of course, employed for the purpose of assisting in closing the bag after it has been filled by manually tucking same inwardly. In order to assist in applying the tuck-in type of valve to a bag filling tube, it is desirable for the outer edges thereof, as at 43b and 43c, to be slightly angularly offset relative to one another. This disposition of the edges 43b and 43c is known in this art as the so-called valve outer edge offset effect. It not only assists in applying the tuck-in type valve to a filling tube, but assists in a finger opening of the finished valve. This so-called offset effect is accomplished by cutting the continuous web 223a from the roll 223 along a line which is slightly angularly offset relative to a line perpendicular to the longitudinal axis of the web, that is, slightly angularly offset relative to a line perpendicular to the direction of motion of the web.

It has been found to be desirable practice in so cutting or severing the web 223a to form the supplemental sheets, to extend the cut slightly diagonally all the way across the web such that the supplemental sheet is formed in the shape of a true parallelogram with no unusually shaped corners. If the supplemental sheet shown at 43 in Fig. 7 were modified to exclude a triangular chip portion at 43d and to include a triangular chip portion at 43e then it would be such a true parallelogram. In accordance with one modification of the present invention the supplemental sheet is not such a true parallelogram but is formed as shown in solid lines at 43 for reason now to be set forth.

It was found that when the supplemental sheet was cut in the form of a true parallelogram with a triangular portion or chip as at 43e in the position shown, such portion tended to prevent the proper seating of the supplemental sheet because it engaged the inside portion of the bag valve along the inner upper edge of the diagonal fold lines 15 and tended to be folded back upon itself or to crumple therein. Consequently it was decided to eliminate the chip as at 43e from the leading edge of the continuous web type of sleeve. It is not desirable to sever such chip and to eliminate same entirely from the sheet because a multiplicity of such severed chips may enter a bag or they may become electrostatically charged and collect, by virtue of such charge, in undesired places.

In order to avoid such folding back of the chip at 43e within the corner of the valve, it has been found desirable and successful to cut or notch the oncoming web 223a successively along a relatively short diagonal line substantially 45° to the direction of its motion as at 43f (Figs. 7 and 28) and thereafter to complete the cut across the web along a line 43g, the latter comprising the so-called long transverse cut which is slightly angularly disposed relative to a perpendicular to the direction of motion of the web. The cut 43f is of sufficient length to shape the leading edge of the sheet 43 with one leading corner filleted as shown in Fig. 7.

Such a cutting of the web 223a consequently eliminates the triangular chip as at 43e from the leading edge of the sheet but leaves a triangular

portion attached thereto along the trailing or rear edge as at 43d.

Further with respect to the undesirable effects of the triangular chip at 43e when it is allowed to remain on the leading edge of the sleeve as in the past, when such chip becomes folded back within the corner of the valve there has been produced an undesirable double thickness or additional thickness which preferably should be eliminated because it may hinder the most efficient operation of the sewing machine. Referring to Fig. 12, it will be seen that when the trailing chip 43d is retained at the outer and upper corner of the sleeve, it maintains a constant sleeve thickness at this point which may materially assist in a uniform operation of the sewing machine. Thus not only is the triangular portion at 43e eliminated from the leading edge of the sheet, but it is maintained integral with such sheet and attached thereto along its trailing edge whereby it cannot become mixed with the contents of the bag and whereby it serves a beneficial function of maintaining a uniform valve thickness over a substantial portion of the length thereof.

Referring again to Figs. 7a, 28, 31-33 and 40-42 briefly described, the sleeve forming mechanism carried by the frame 225 has a roller as at 233 which constitutes an idler roller and over which the web 223a is passed immediately prior to the motion of the web into the device for effecting the above-described 45° cut at 43f (Fig. 9) which eliminates the triangular portion at 43e.

Such 45° cut in the web, as 43f, is effected by means of a rotating knife 234 which is mounted upon a suitable rotating support as at 235 driven in desired timed relationship with the motion of the web. The knife 234 is, of course, angularly disposed relative to the axis of the support 235 in such a way that for each rotation thereof a short 45° cut is made in the web and against a resilient roller, preferably of rubber, as at 236.

Thereafter the web 223a is led to the rest of the mechanism via an adjustable roll 237 which is referred to as a compensating roll and is adapted for positioning the cut 43f in the web 223a with respect to the above-described long transverse cut which is formed by means of a rotary knife to be later described.

Said compensating roll 237 has such adjustable characteristics imparted thereto by virtue of its mounting which, in the form shown, is constituted by means for angularly shifting said roll 237 about an axis parallel to its own axis, such adjustment axis comprising the axis of a support rod 239. A pair of supporting pins 237a, secured one at each extremity of the roll 237, are rotatably mounted respectively upon arms 240 and 241 which in turn are secured to said support rod 239. Thus by angularly shifting the support rod 239 or the arms 240, 241, it is possible angularly to shift the roll 237 about the axis of rod 239 which latter is, of course, parallel to the axis of roll 237. The angular position of the arms 240, 241 can be manually controlled, in the form shown, by means of a suitable hand wheel 242 having secured thereto a threaded rod 243 which, at the opposite extremity thereof, is associated with an arm such as 240 by means of a ball and socket joint. A stationary threaded adjustment block 244 embraces said threaded rod 243 and is secured in a fixed position whereby manual adjustment of the hand wheel 242 will move the roll 227 in a desired manner.

The sleeve forming device is also provided with

an annularly grooved or slit roller as at 245 upon which the paper for the supplemental sheets may be slit in case a sheet is to be formed of the type shown as at 50 in Fig. 7a. That is, with this form of sheet which is designed to provide a flexible valve flap extension sheet, a central slit S is cut substantially along what will become the fold line at the bottom of the valve, this slit extending inwardly from the inner edge of the sheet to a point close to the line as at T at which the inner edge of the valve flap per se will be located. Also two parallel side slits S', of short length, may be cut along lines which will be adjacent to the shoulders of the bag at the top of the bag when it is filled, such slits facilitating the flattening of the flexible extension sheet up against the top of the bag under pressure of the contents when filled.

The roll 245 may be provided with a plurality of spaced annular grooves or slots as at 245a for cooperation with suitable reciprocating knives, to be later described, for forming the slits S and S'.

The roll 245 not only serves the purpose of a so-called slitting roll, in case a sheet is to be formed of the type as in Fig. 7a, but this roll cooperates with another roll 246 for pulling the paper from the main source roll 223. Thus the rolls 245 and 246 constitute so-called feed or pinch rolls for pulling the web at a desired rate. Rolls 245, 246 are drivably connected to the sprocket wheel 227 by a suitable gear train as shown in Fig. 28.

Reverting to Figs. 28 and 33, the paper, after being slit at roll 245, if desired, passes onto the cutter rolls 247, 248 for cutting the band of paper into sleeve lengths. The cutter roll 247 is provided with an angularly disposed slot therein or an angularly disposed cut away portion as at 247a (Fig. 33) in which there is secured a knife 249 which is thus positioned for effecting the slightly diagonal cut across the web. The knife 249 must be so positioned that one extremity of the cut formed thereby in the web 223a is co-terminus with the inner extremity of the diagonal cut 43f whereby a sleeve 43 is formed as shown in Figs. 7-12. Although the knife 249 is shown in Fig. 28 extending all the way across the web 223, such knife should be shortened or repositioned to effect the cut described in the preceding sentence. The knife 249, however, as shown in Fig. 28, is adapted for forming sleeves in the form of true parallelograms, the knife 234, of course, not being employed when it is desired to form the latter type of sleeves.

During the cutting operation by the knife 249, the portion of the paper which protrudes beyond the cutter rolls 247 and 248 is received between a pair of so-called forwarding rolls 250, 251. The forwarding rolls 250, 251 move at an angular rate faster than the feed rolls 245 and 246 and also faster than the cutter rolls 247, 248 whereby a sheet is grasped and pulled against the knife 249 for spacing the sleeves after cut-off. The roll 251 is preferably of a solid and cylindrical conformation which provides a suitable backing against which the roll structure 250 can grasp a sleeve and urge it forward. The roll structure 250, in the form shown, is constituted by a plurality of disk members 250a which are secured to a suitable central shaft 252. Each disk member 250 is so conformed that slightly less than half of its periphery is adapted for grasping and urging the oncoming sheet and the remainder of such periphery is undercut so that

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it will not engage the web or sheet in cooperation with the roll 251. A transverse bar 253 is secured to the disks 250a and extends parallel to the shaft 252 and is associated with the high portion of the peripheries of the disks 250a at the initial or forward portion thereof, that is, the portions thereof which normally first contact the oncoming sheet. Thus by means of the transverse bar 253, which is also referred to as a forwarding bar, a firm grip can be obtained upon the oncoming sheet immediately before and after it has been severed, such grip extending throughout the width thereof. The transverse bar 253, by virtue of the association with the oncoming sheet all the way across the width thereof, pulls same against the cutting knife and thus prevents an uneven cut which ordinarily might occur if only the spaced disks 250a were employed.

After the length of the web comprising a supplemental sheet has been severed by the knife 243 and grasped by the forwarding rolls 250, 251, it is advanced to a scoring roll means 254, 255 which are adapted for forming longitudinal score lines for certain types of supplementary sheets such as that shown in Fig. 7a. That is, assuming that the supplemental sheet is to be formed as in Fig. 7a, at the latter scoring roll means the paper is creased along a line C which is parallel to and spaced a small distance from the slit S. This serves to provide a narrow flap portion f, so that as the valve extension sheet 50 is crowded up against the top of the bag when filled, the edges of the paper at the sides of the slit S will readily overlap without jamming.

The scoring roll means 254, in the form shown, includes a score disk 254a (Figs. 28, 52) for cooperating with a groove 255a in roll 255 in order to crease the sheet 53 along said line as at C. Disk 254a can be secured to a collar 254b. Suitable means of well known type can be employed for detachably mounting the disk 254a. Collars or forwarding disks 254b are secured to the same shaft with the scoring disk 254a and are thus adapted for rotation therewith and by cooperation with the solid roll 255 grasp each oncoming severed sheet and forward same toward and between rolls 256 and 257.

If desired, the same or similar scoring disks might be used for creasing the center lines of supplemental sheets of the tuck-in type, such as 43, but ordinarily this will be unnecessary.

The rolls 256 and 257 and associated means serve the dual purpose of (a) cooperating for the application of glue to the sheets preferably on preselected spots as shown at 46 (Fig. 7), and (b) for the formation of a lateral score line as at 43h near the leading edge of a sheet such as 43, such score line being positioned to facilitate the folding over thereof to the position shown in Fig. 8. That is, such a lateral score line as at 43h is so positioned that the grippers 45 between the upper surfaces thereof will engage such sheet at opposite extremities of the score line 43h whereby the folding over of the sheet is facilitated along such line by means of the fold-over arms 48.

The transverse scoring of a sheet along the line 43h is unnecessary in the type of sleeve shown in Fig. 7a and may be dispensed with by removal of a scoring bar which effects same.

Referring to Figs. 28, 33, 47-51, inclusive, the roll 257 is provided with a longitudinal groove 257a thereupon, the latter being adapted for cooperation with a scoring blade or bead 256a mounted upon the roll 256. The scoring blade 256a may be removed when desired.

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Glue is applied to the supplemental sheet by means of a mechanism associated with the roll 257 and comprising a radially reciprocative glue applicator bar 258 which is mounted for radial sliding movement within a longitudinal groove 257b in the roll 257 (Fig. 48). As shown in Figs. 47 and 49, the glue applicator bar 258 is urged inwardly toward the axis of the roll 257 at each extremity thereof by springs 259, one extremity of each of said springs being fixedly secured to the roll 257 and the other extremity thereof being secured to an extremity of the bar 258.

The springs 259 urge rollers 260 against stationary cams 261 which effect the reciprocative movement of the glue applicator bar 258. A high point of the cam 261 is positioned to thrust the bar 258 radially outwardly into contact with a glue fountain roll 262 which is partially immersed within a reservoir 263 of glue or any suitable adhesive. A doctor blade 264 pivotally and adjustably mounted at 265 in a conventional manner is associated with the fountain roll 262 to scrape off the excess of adhesive. The cam 261 is so shaped that the outer surface of the glue applicator bar 258 will be flush with the cylindrical outer surface of the roll 257 when such applicator bar is adjacent the roll 256. Bar 258 is preferably shaped to apply glue in a row of dots as at 46.

Thus there occurs an automatic reciprocation of the glue applicator bar which insures that glue will be applied in a row of dots along the forward under edge of sheet 43 in such a manner that the outer surface of roll 257 will not become covered with glue. The glue bar 258 slides in and out under the influence of the cam 261, that is, out to touch the glue roll 262 and then back inwardly flush with the carrier roll or main roll 257 where it engages the supplemental sheet.

If desired, portions of the glue applicator bar 258 may be removed or adjustably mounted in order that only that portion of the glue bar which is equal in width to the width of the web, will receive a series of dots of adhesive. Thus there will be avoided a transfer of adhesive onto the roll 256 at points beyond the web 223a which might eventually cause a smearing of adhesive upon the web.

After the supplemental sheet has been acted upon by the above-described rollers, it is delivered to the ram mechanism for application to the open end of the bag tube. In order to prevent the supplemental sheet from being carried around with the roller 257, the latter is provided with a plurality of slots as at 257c which are peripheral in nature and which are formed in a plane perpendicular to the axis of the roll 257. The teeth of a stripper comb as at 266 (Fig. 33) engage said slots 257c and strip the sleeve or supplemental sheet from the roll 257 and thus insure that it is directed to the sliding ram 44 and beneath the open gripper fingers 45 (Figs. 7 and 8). Bar 258 is correspondingly slotted to avoid conflict with the stripper comb.

Referring now to Fig. 28 is further detail, the slit S (Fig. 7a) may be cut by a razor blade 267 detachably secured to a rocker arm 268 which is keyed to a shaft 269, the latter in turn being rocked by a roller arm 270 carrying a roller 271 which bears against a cam 272. This cam may be mounted in angularly adjustable position upon a constantly rotating shaft 273 such that a corner of the razor blade will be held in slitting engage-

ment with the paper for the requisite intervals in order to form the slits S.

For cutting the slits S', razor blades may be provided as at 274 and 274' which are mounted and operated by means similar to that provided for the blade 267 and actuated by a cam 275 also mounted upon the shaft 273, as will be readily apparent from said Fig. 28 without further description. It will be understood that the cam 275 is also angularly adjustable and so shaped that the blades 274 and 274' will have slitting engagement with the paper during the requisite intervals for forming of the slits S' of the desired length. The arms which carry the razor blades 267, 274 and 274' may all be adjustable along their respective keyed shafts which carry same so that the positions of the slits S and S' may be adjusted, if desired, transversely of the paper web in order to accommodate webs of differing widths. The rollers which bear against the cams 272 and 275 normally may be held in contact therewith by suitable springs as at 276 (Fig. 32) which are connected between the rollers arms and any suitable fixed points on the frame. In case it is desired to form a supplemental sheet without such slits as at S and S', then the follower rollers which bear against the cams 272 and 275 may be elevated out of contact as by turning a rotatable eccentric member 277 (Fig. 32).

The surface of the roller 245 is provided with said annular slits 245a, a series of which may be formed along the roll and spaced, for example, at distances of one-eighth inch apart. The razor blades should be adjusted to positions corresponding to one or another of these slits so that the blade edges cutting through the paper will pass into one of the slits without damaging the blade. With the slits spaced one-eighth inch apart, it will be apparent that the parts will be adjusted to form the slits at any position transversely of the paper web as desired within a tolerance of one-eighth inch.

The roller 246 which presses against the slitter roller 245 may be carried on a shaft which is journaled in any suitable type of slidable spring supported bearing blocks as at 278. These blocks may be held down in position by a shaft 279 which may be rotatably carried by blocks as at 280. The shaft 279 has a flattened side as shown at 281 and may be so turned as by a handle 282 so that the flattened side will be turned against the bearing blocks 278, thereby allowing the roll 246 to rise on its spring supported bearings to facilitate the threading of the paper web in between the rolls 245 and 246. The path of travel of the paper web from the roll of paper over various idler rolls or guide bars and onto the slitter roll 245 will thus be apparent from Fig. 28.

The gearing and other interconnections for said rolls will now be described. Secured to the opposite extremity of the shaft 251a is a gear 283 which transmits torque to the roll 248 by means of a gear 284 and an intermediate idler gear 285. It is, of course, understood the various gears herein described are secured to suitable shafts turning their respective rollers. Rotatable upon the same shaft with the gear 284 is a gear 286 for transmitting torque to the roller 245 by means of an intermediate idler gear 287 and the gear 288 which is upon the shaft of the slitter roller 245. It will be understood that the upper rolls 246, 247, 250, 254 and 256 may each be driven by gears meshing with the gears for the

corresponding lower rollers and at a one to one speed ratio.

In order to change the lengths of the sheets as severed at the cutting rolls 247, 248, the speed at which the rolls 245 and 246 are driven may be altered by changing the gear 286.

When this is done, the position of the gear 287 has to be changed in order that it will remain in mesh with both of the gears 286 and 288. For this reason the gear 287 may be journaled as at 287' (Fig. 32) upon a bracket 289. This bracket may be angularly shifted to desired positions about a bushing, for example, carried by the shaft for the roller 245. Suitable slot and screw means as at 290 are provided for fixing the bracket in a desired angular position of adjustment.

Torque is communicated to the torque rolls 254, 255 by means of an idler gear 291 which meshes with gear 283 and a gear 292 for driving the roll 255.

The rolls 256, 257 and 262 have power or torque communicated thereto from the gear 292 via an idler gear 293 which meshes with the gear 292 and a gear 294 upon the shaft of the slotted roller 257. The fountain roll 262 may be driven in any suitable manner, for example, by means of a gear interconnection with the shaft of the roller 257.

Shaft 273 and knife support roll 235 are continuously driven by any suitable interconnection with the power source including a sprocket chain 273a and relative gears as shown in Fig. 28.

Referring again to Figs. 33 and 52, if a sheet such as that shown in Fig. 7a is to be formed, then a straight cutter bar is to be used for cutting a straight transverse edge across the sheet which is perpendicular to the direction of motion of the web 223a. Such a straight cutter bar is shown as at 249a which blade is preferably mountable approximately diametrically opposed to the above-described cutting blade 249 which is arranged to form the slightly diagonal transverse cut across the web in conjunction with the so-called 45° scoring knife 234. Of course, only one of said knives 249 or 249a is used at a time, depending upon the type of sleeve to be formed.

If the supplemental sheet is of the type as shown in Fig. 7a, means should be provided for forming a short slit as at SS at the end of the narrow flap portion f or, if preferred, an arcuate form of short slit may be provided which is substantially of the same length as slit SS, except that it curves toward the upper edge of the sheet 50 as viewed in Fig. 7a. For this purpose a knife element as at 295 (Fig. 47) may be mounted to extend in a radial position at the middle of the roll 257 with its lower sharpened end edge protruding as at 295' at a proper position on such roll to form the slits SS as shown in Fig. 7, or the above-mentioned arcuate slit. The inner end of this knife member may be secured by a suitable set screw which is accessible from the surface of the roll to permit adjusting of such lower end edge to protrude to the desired extent. It will be understood that the cross-section of the protruding knife end edge may be straight if a slit as at SS is desired, or arcuate if the arcuate slit is desired.

In passing from one pair of rolls to the next, the supplemental sheets may be supported on plate members as at 296, 297, 298 and 299 which are located respectively between the successive pairs of the rolls as shown in Fig. 3. Finger portions may extend from the plate 299 into the annular grooves formed in the roll 257, and, if desired,

such finger portions may extend partly around the roll 257 to a point adjacent the fingers of the above-described comb device 266 whereby the sheets are guided along toward the ram structure 44 to direct the supplemental sheets against the latter structure as they leave the roll 257 and thus act to insure that the dots of adhesive will not cause the supplemental sheets to continue to adhere to the roll 257.

Sleeve applying device

As has been described above in connection with Figs. 7-9, inclusive, the sleeve applying device is constituted by a reciprocating ram structure which is constituted by three sub-elements or portions 44b, 44c and 44d which are adjustably secured to a reciprocating support 47. Said sub-elements or portions may be adjusted in position in order to accommodate supplemental sheets of varying widths. That is, the sub-elements 44b and 44c may be spread apart or moved closer to the central element 44d for such purpose. Suitable means such as slot and bolt interconnections for so adjustably securing said sub-elements or portions may be provided.

A further detailed description of the reciprocating sleeve applying device will now be set forth with special reference to Figs. 7-9, 28, 31, 32 and 43-46, inclusive.

The ram mechanism indicated in Fig. 28 may be carried by a supplemental frame structure which is mounted upon the top of the frame structure 225.

Referring again to Fig. 28, torque is communicated to the cam shaft 229 of the ram lift cam 230 by means of said sprocket chain 226 which passes over the sprocket wheel 159. Thus rotation of the shaft 229 will cause oscillation of a ram lift arm 300 which carries a roller 300a which is urged against the periphery of the ram lift cam 230. The ram lift arm 300 is connected to the support member or main ram plate 47 by means of a link 301.

The main ram plate or supporting structure 47 is slidably mounted in a pair of oppositely disposed grooved member or ram plate guides 302 and 303 having formed therein respectively grooves 302a and 303a which are formed for receiving the sides of the main ram plate 47. In order to facilitate the movement of the main ram plate 47 within the grooves 302a and 303a, suitable guide blades as at 47a and 47b (Fig. 43) may be provided for directly engaging in said grooves, said blades being adjustable toward or away from one another in order to compensate for wear in the grooves 302a and 303a.

Reverting to Figs. 7-9, the gripper fingers 45 are each mounted upon a respective rod 45a by means of a conventional collar device which embraces its respective rod 45a and which may be adjustably positioned thereupon. The rods 45a extend parallel with and closely adjacent to their respective sub-elements 44b, 44c and are journaled thereupon as at 45b adjacent the lower extremities of said rods 45a, and journals 45c adjacent the upper extremities of said rods.

The means for controlling the opening and the closing of the gripper fingers 45, in the form shown, comprise so-called rotary solenoids as at 304. Instead of such rotary solenoids as at 304 other suitable means, such as pneumatic power cylinders, may be employed. The latter are preferably controlled by means of suitable cams and microswitches, the cams being preferably mounted upon the power shaft 149 for the ram lift cam. If desired, a separate cam for each of

the solenoids 304 may be provided but preferably a single cam for actuating both solenoids simultaneously is provided.

Normally the gripper fingers 45 are held in an open position by means of springs 305, one extremity of which is secured, as shown in Fig. 44, to a pin 304a attached to a plate member 304b comprising a portion of the solenoids 304. Said plate 304b is, of course, secured to the shaft 45a for angular motion therewith. The opposite extremity of the spring 305 is mounted upon a relatively fixed portion of its respective sub-element or portion 44b or 44c.

The energization of the solenoids 304 by means of said cams is controlled in such a manner that the fingers 45 are snapped shut when a supplemental sheet, as at 43, is moved into a position as shown in solid lines in Fig. 33 after having been acted upon by the sleeve forming device 224, above described.

The sleeve fold-over arms 48 illustrated in Figs. 7-9, inclusive, as above mentioned, commence to operate as the slide or ram approaches its lowest position but preferably somewhat before it reaches this position. However, by the time such ram is in its lowest position, the fold-over arms 48 have shifted angularly a maximum from the position shown in Fig. 7 to that shown in Fig. 8 and the sleeve is completely folded over the valve flap extension 14a. The sheet fold-over arms 48 may be actuated by a so-called rotary solenoid analogous to solenoids 304 of Fig. 43. However, it has been found desirable to actuate said fold-over arms by means of a rack and pinion device, as shown in Fig. 46. This device, in the form shown, is constituted by a rack 306 which is mounted for engagement with a pinion 307, the latter being fixed to the interconnecting pivot rod 49 of said fold-over arms 48. As shown in Figs. 43 and 46, a suitable control rod 308 is secured to the rack 306 and extends generally upwardly at an inclination equal to that of the slide ram structure.

The control rod 308 preferably extends within a U-shaped portion of the central element 44d (Fig. 43) and has surrounding same, throughout a portion of the length thereof, a spring 309 which at one extremity engages a fixed collar portion 310 upon said central element 44d and at the opposite extremity thereof engages a collar 308a whereby the rack 306 is urged downwardly in order normally to hold the fold-over arms 48 in the position shown in Fig. 7.

The angular shifting of the fold-over arms 48 from the position shown in Fig. 7 to that shown in Fig. 8 is accomplished by means of a fixed collar member 310 which thus does not participate in the reciprocating movement of the ram device but which surrounds loosely the rod 308, as shown in Fig. 43, and is positioned engaging a collar or nut 311 on rod 308 when the ram 44 and rod 308 approach the lowest point of their reciprocative movement. By virtue of the engagement of the collar or nut 311 with the collar 310, the spring 309 is overcome and the rack and pinion 306, 307 is actuated to move the arms 48 to the position shown in Fig. 46. It will be readily apparent that by means of spring 309, the fold-over arms 48 will be retracted automatically to the position shown in Fig. 7 when the ram is moved upwardly from its lowermost position after the release of the supplemental sheet.

It will be apparent from Fig. 43 that careful adjustment of the timing and extent of the angular movement of the fold-over arms 48 may be

made by adjustment of the position of the nut 311 and also, if desired, the nut 311 may be shifted upwardly as viewed in this figure in order to render the fold-over arms inactive in the event that it is desired to apply a supplemental sheet such as that shown in Fig. 7a.

Final conveyor

A description will now be given, with reference to Figs. 20, 53-59, inclusive, of the conveyor means for advancing each of the bag tubes from the fly stick device above described to the sewing machine having sewing heads 107, 108 (Fig. 20).

Referring to Fig. 20, in general the final conveyor comprises a pair of endless chains as at 312 and 313 which are mounted respectively upon pairs of suitable sprocket wheels 314 and 315. Pusher fingers are secured to such chains for engaging the trailing edges of the bags for advancing same. One of such endless chains, as at 312, is indicated in greater detail in Fig. 56. Secured to the chains 312, 313 in spaced relationship thereupon are a plurality of upstanding fingers as at 316 (Fig. 56) each of which is pivotally mounted as at 317 upon a bracket 318 which is preferably integral with one of the links of the chain as at 314a. The finger 316 is angularly shiftable about the pivot 317 under the influence of a spring 319 which is secured to the finger 316 at one extremity thereof and to an upstanding bracket 314b which is secured to another link of the chain as at 314c. Thus, as viewed in Fig. 56, the finger 316 shown in solid lines in a vertical position is urged counterclockwise. Said vertical finger 316 is held in such a position while it is traversing the upper run of the chain's path by means of an arm 320 having a roller 321 upon the extremity thereof, which roller is positioned for riding upon a cam surface 322 which, except for the extremities thereof, comprises a flat cam rail or cam surface. The cam rail 322 is provided with an inclined or tapered portion as at 322a at the right hand extremity thereof as viewed in Fig. 6 in order to permit the roller 321 to slide downwardly whereby the spring 319 will retract the finger 316 to an inactive position when the bag has been thrust as desired into the sewing machine. The opposite extremity of the cam rail 322 is formed as at 322b, and is adapted for engagement by the rollers 321 for repositioning the fingers 316 into an active position for engaging the rear edges of the oncoming tubes.

If desired, the cam rail 322, or at least a portion thereof, may be longitudinally adjustable by means of a suitable rack and pinion device as shown in Figs. 56 and 58, the pinion being shown as at 323 and the rack at 324. The rack may be secured to a portion of the cam rail 322, as shown in Fig. 58. Said cam rail 322 is preferably mounted for sliding longitudinal motion by virtue of a tongue and groove arrangement with a frame part of the apparatus as indicated, by means of an arm 325 having a tongue at 325a which engages a groove in a block 326 secured to the frame part of the apparatus. The arm 325 is in longitudinal sliding engagement with the block 326 and is there held by means of a cover plate 327. Adjustment of the pinion 323 in order to control the longitudinal position of the cam rail 322 may be had by means of a worm and wheel device 328 which may be adjusted by means of a handle 329, said worm being secured to the shaft of the pinion 323.

The longitudinal shifting of the cam rail 322

controls the position of both of the extremities thereof 322a, 322b whereby an adjustment may be had of the precise point at which the fingers 316 are retracted to an inactive position and raised to an active position.

As is best shown in Figs. 57 and 58, each sprocket chain 312 and 313 rides along a support rail as at 330 which is positioned for supporting only the upper run of the chains.

The mechanism for longitudinally adjusting the cam rail 322 simultaneously moves both the extremities 322a and 322b. However, it may be desirable to have such extremities of the cam rail individually adjustable longitudinally, the rail being divided, for example, near the midpoint, for example, in a telescoping arrangement. Individual rack and pinion devices for so adjusting the opposite extremities of the cam rail may be employed.

As shown in Fig. 20, the endless chains 312, 313 are operatively connected to the main power source by drivably connecting a sprocket wheel shaft 331 with the shaft 135, for example, by suitable sprocket chains and wheels as shown comprising a sprocket chain 332 passing over suitable sprocket wheels which are respectively secured upon said shaft 331 and a shaft 333, the latter being drivably connected with the shaft 135 by means of a sprocket chain 334.

Referring to Figs. 53 and 59, when a valved and sleeved but unsewn bag tube has reached station No. 5 (Fig. 21), a pair of reciprocating transfer fingers are positioned for getting behind the bag tube and urging same positively out of the fly sticks into position for engagement by a pair of the fingers 316. Such transfer fingers are indicated in Fig. 53 at 335, and the mechanism for controlling same is shown in Fig. 59 wherein the finger 335 is mounted upon a horizontally and longitudinally slidable arm 336 which is reciprocated under the influence of a rotating crank 337 which communicates an oscillating angular motion to an intermediate shaft 338 by means of a link 339 which interconnects the crank 337 and a rocker arm 340 upon said shaft 338. A spring 341 normally urges the rocker arm 340 to the left as viewed in Fig. 59. The slidable arm 336 is reciprocated by means of an interconnecting arm 342 which is adjustably secured to and oscillates with the shaft 338. Arm 342 is associated with the arm 336 by means of a bifurcated extremity 342a which engages a suitable pin 336a.

The crank 337 mounted upon a crank shaft 337a is continuously driven by any suitable means, for example, by means including a sprocket chain interconnection with a shaft 333.

It has been found desirable to effect a final pressing of the valve corner of the valved sleeved bag tubes after they have been released by the fly stick mechanism whereby such valve corner is given a final positive creasing and prepared for sewing. A device for accomplishing this is shown in Figs. 53-55 and is constituted by a segmental presser unit 343 having a pressing palm or segmental press member 344 which is mounted for rotation about a shaft 345 which is rotatable in preselected timed relationship with the procession of bags, and constructed and arranged for pressing the valve corner thereof against a backing plate 346 as the bags pass therebeneath. As shown in Fig. 54, the shaft 345 is drivably connected to said shaft 333 by bevel gears, as at 347, intermediate shaft 348 and bevel gears 349. The pressing palm 344 preferably is re-

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silently mounted and urged radially (Fig. 54) outwardly by means of a spring 344a whereby the palm is pushed out against a suitable limit stop. Thus the pressing palm can be moved yieldingly radially inwardly against the pressure of spring 344a when a valve corner of a bag is undergoing pressing. The spring 344a preferably is mounted co-axial with an arm 344b which interconnects the pressing palm 344 with a rotating support arm 344c which contains the spring 344a.

In order to accommodate bags of varying lengths or sizes, it is desirable for the conveyor chains 312, 313 to be mounted for adjustment towards or away from one another. In the form shown, the conveyor chain 312 is mounted for transverse movement relative to the direction of motion of the bag tubes, that is, towards or away from the conveyor chain 313. The shaft upon which the right hand sprocket 314 is mounted is preferably splined to permit such transverse movement and a suitable frame element 349a extending between the sprockets 314 can be so transversely shifted, for example, by means of a threaded shaft 350 which may be turned by means of a suitable crank which may engage an extremity 350a of square cross-section. The threaded shaft 350, by means of a collar device, as at 351, is restricted from longitudinal movement and by virtue of its threaded engagement with said frame element, as at 352, is adapted for moving the sprockets 314 towards or away from sprockets 315.

The transfer fingers 335 are adjustable transversely simultaneously with the adjustment of the chain 312 by means of the splining of shaft 338 as at 338a, which permits axial movement of the upper arm 342 (Fig. 53). The upper longitudinally reciprocative arm 336 in this figure is mounted for movement with frame 349a.

Suitable support plates as at 353 and 354 support bag tubes between the chains 312, 313.

A brief description of a cycle of operation of the apparatus upon one bag as it passes through the machine is as follows: The bag tube 10 is grasped near the opposite extremities of the leading edge thereof (Fig. 1) by grippers 22 and is pulled through the apparatus along a path which is common to the path of successive bags which follow thereafter. A corner of the bag tube 10 is subjected to precreasing to form diagonal fold lines (Fig. 4) which assist in accurately positioning the parts of the bag valve while undergoing shaping. Thereafter, as shown in Fig. 2, the forward gusset of the bag tube 10 is spread by the gusset wedge 21 (Fig. 2) and the bag tube is moved by the grippers 22 on the conveyor chains 23 between a pair of fly sticks 113 (Figs. 3 and 21). The extent of the movement of the bag toward the center of the carrying structure for said fly sticks is determined by adjustable limit-stops 88a (Fig. 13). When a bag tube has engaged the limit-stops 88a, as shown in Fig. 13, the tube has been advanced sufficiently to permit the insertion of the butterfly 20, as is well shown in Fig. 3. The points 29a of the butterfly 20 are then preferably about one-half inch from contact with the inner or center fold line of the gusset. The bag tube, as shown in Fig. 3, is in station No. 1 and after the accurate positioning thereof by said limit-stops 88a, the bag tube is positioned along the longitudinal axis thereof by means of the transverse bag tube aligner 105. Thereafter the fly sticks 113 close and the bag tube is angularly shifted to station

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No. 2 (Fig. 4) whereupon the wings of the butterfly 20 are spread thereby spreading the gusset and forming the valve flap 14 which, in the condition shown in Fig. 4, is in an accessible or exposed position with the valve flap extension 14a extending, as viewed in this figure, in an upward and outward position.

At station No. 2 the valve flap is acted upon, as shown in Figs. 5, 5a-5e, inclusive, and 6, to insure that it is accurately formed and positioned for folding inwardly to form the bag valve and also accurately formed and positioned for receiving a supplemental sheet if the latter is desired. Thus at this station the umbrella element 25 is first applied by thrusting same against the spread tube end with the umbrella arms 27 initially in a folded or inactive position, such arms being snapped into alignment for making more taut the valve flap whereupon the valve press ram 28 is urged against the lower region of the valve flap 14, thereby positively forming the base fold crease 14d. The umbrella element 25 and the valve press ram 28 at this point are both in engagement with portions of the spread bag tube and of the valve flap respectively. They are thereafter withdrawn during which the umbrella arms 27 act to thrust outwardly, as viewed in Fig. 6, the valve flap 14 and particularly the valve flap extension 14a, thereby preventing the hugging of the valve flap against the spread tube end which would hinder the insertion of a supplemental sheet.

Thereafter a supplementary sheet, for example, of the tuck-in valve type, is applied by means of the apparatus shown in Fig. 43, such supplementary sheet having been formed by the device shown in Fig. 28. The sheet ram or sleeve ram (Figs. 7, 43) grasps, by means of gripper fingers 45, a supplementary sheet 43 and urges same behind an open valve flap, as well shown in Figs. 7 and 8. The valve flap is provided with adhesive in dots, as at 46, which adhesive binds the leading edge area of the supplemental sheet to the area behind the valve flap extension 14a, as shown in Figs. 7 and 8. The fold-over fingers 48 fold the sleeve over along the fold-over line 43h and hold-down fingers 51 thereupon engage the upper edge of the folded over supplemental sheet (Fig. 9). At this time the sheet ram 44 is withdrawn upwardly to grip another sheet for the next succeeding bag valve.

Thereafter the tucking blade 53 is urged in angular and linear movement against the supplemental sheet 43 and the valve flap structure which supports same. Shortly after the tucking blade 53 has engaged the sleeve and is about half way through its range of angular movement, the hold-down fingers 51 are withdrawn and after the tucking blade has reached substantially the extreme position of its angular tucking movement, the wings of the butterfly 20 are at least partially closed and the parts of the bag valve are in the positions shown in Fig. 11. The tucking blade 53 thereafter is withdrawn. The above-described insertion of the supplemental sheet 43 occurs at station No. 3, the sheet applying station. Thereafter the fly sticks are shifted to move the bag to a release station (station No. 5) whereupon such fly sticks or bag clamps are opened and the bag tube with the unsewn bag valve therein is engaged by upstanding fingers 316 of the final conveyor consisting of the endless chains 312, 313. This conveyor moves the valve structure beneath and in timed relation with the pressing palm or seg-

mental press member 344 which presses the valve corner against a backing plate 346 as the bag passes therebeneath in order to prepare same for the sewing of the bag tube end, together with the valve formed therein. Thereafter the final conveyor moves the bag tube into engagement with the sewing heads 107, 108 (Fig. 20) for sewing the ends of the valved bag.

While the invention has been described with respect to certain preferred examples which have given satisfactory results, it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended therefore in the appended claims to cover all such changes and modifications.

What is claimed as new and is desired to be secured by Letters Patent is:

1. In apparatus for inserting tuck-in type sleeves for the valves of valve bags, in which apparatus gripping means are provided for gripping each bag in a flat condition near a corner thereof in which a valve is to be formed and devices are provided for spreading the bag walls at such corners to form there a valve flap which is exposed at a sleeving station, such flap being in at least a partially spread condition, the combination comprising: paper strip feeding rollers positioned and mounted to feed a strip of sheet material to form the sleeves, a cutter having a blade for periodically cutting the strip at each cut transversely thereof along a line which is slightly angularly offset from a line perpendicular to the center line of the strip, a strip gripping and applying device for directing each successive cut end edge of the strip comprising a sleeve length toward the valve flap with the center line of such sleeve length being substantially in the same plane as a center line of the valve flap, whereby the sleeve length is moved to a substantially flatwise and partially overlapping position in respect to an inner portion of the valve flap, such device including gripping means for gripping a sleeve length near a cut end edge thereof, such edge under the influence of the motion of such device becoming the leading edge of such sleeve length, the other cut end edge becoming the trailing edge of such sleeve length, and foldover means angularly shiftable about an axis perpendicular to the center line of the sleeve length so overlapping for folding over the remaining portions of the sleeve length against an outer surface of the valve flap, the cut end edges of the sleeve length being positioned as the inner and outer end edges of the sleeve.

2. Apparatus for forming valves in bags and introducing supplemental sheets therein to form sleeves in such bags, comprising a plurality of clamps, means for carrying said clamps and operating same for carrying a succession of the bags from a feeding station through a plurality of intermediate stations to a release station, means constructed and arranged for moving with each clamp for first spreading the valve corner of the bag after it is clamped by a respective clamp, the spreading of the valve corner of each bag forming an accessible valve flap at such corner and spreading the ends of the bag tubes, bag tube spreader means operative at a subsequent station for engaging the partially spread tube ends adjacent said accessible valve flap and spreading same to a preselected extent, valve press means operative after the actuation of said tube end spreader means for pressing por-

tions of the spread tube end corner against said spreading means, a device thereafter operative to insert a supplemental sheet while the corner is spread and to shape the valve and such sheet therein, mechanism effective concurrently with the shaping of the valve and sheet therein for collapsing the spread bag tube corner, and means thereafter for releasing the bag tube.

3. In apparatus for inserting sleeves into bag tube ends for the valves of valve bags, in which means are provided for holding a valve corner with a valve flap of such tube end in flattened exposed position and means are provided for placing a supplemental sheet to form such sleeve in partially overlapping flatwise relation to the valve flap, the combination of sheet foldover means angularly shiftable for folding over a part of such sheet whereby areas of the latter are positioned in substantially flatwise contact with the outer and inner surfaces of the valve flap, sheet clamping fingers operatively associated with said sheet placing means and mounted for grasping such sheet at opposite side edges thereof at the extremities of a preselected fold line thereon and near the forward edge thereof, such fold line being substantially perpendicular to the longitudinal axis of such sheet, the portion of such sheet held between said fingers being flat against said sheet placing means, mechanism including a cutter for periodically cutting a continuous strip of paper for forming a series of such sheets, mechanism for grasping and urging such cut sheets toward said placing means with the leading end edges thereof substantially parallel to such edges of a sheet gripped by said fingers on said placing means, and mechanism for operating said foldover means and clamping fingers in timed relationship to release the latter after the placing of the sheet in such partially overlapping flatwise relation and after actuation of the foldover means.

4. In apparatus for inserting tuck-in type sleeves for the valves of valve bags, in which apparatus gripping means are provided for gripping each bag in a flat condition near a corner thereof in which a valve is to be formed and devices are provided for spreading the bag walls at said corner to form from such corner a valve flap portion which is exposed at a sleeving station, such portion having a median line and being in at least a partially spread condition, the combination comprising: paper strip feeding rollers positioned and mounted to feed a strip of paper to form the sleeves with the center line of the strip substantially in the same plane with the median line of the valve flap portion, a cutter having a blade for periodically engaging the strip transversely thereof each engagement effecting to cut along a line which is slightly angularly offset from a line perpendicular to the center line of the strip, whereby sleeve lengths are cut therefrom, which lengths at each end thereof when folded in the bag valve will have one portion of the extending end edge beyond another portion, a device for directing each successive leading cut end edge of the strip comprising a sleeve length as advanced by said rollers toward the valve flap portion to a flatwise position in respect to and partially overlapping the valve flap portion along an inner marginal area thereof, the other cut end edge of such sleeve length comprising a trailing edge, and foldover means angularly shiftable about an axis perpendicular to the center line of the sleeve length for folding over the remaining portions

of the sleeve length whereby it is positioned in contact with the outer surface of the valve flap portion, the cut end edges of such sleeve length being positioned as the inner and outer end edges of the sleeve.

5. Apparatus for forming valves having supplemental sheets in flattened gusseted bags having in combination: a plurality of pairs of clamp elements for holding a succession of flattened bag tubes in side-by-side relation; mechanism for advancing said clamp elements step-by-step for carrying the tubes from a feeding station to succeeding stations including a supplemental sheet applying station and a discharge station; clamp element operating devices operative in timed relation with said mechanism for closing each pair of clamp elements at said feeding station and for opening same at said discharge station to permit discharge of the tubes; and power operated devices operatively associated with said advancing mechanism for acting in timed relationship therewith, said devices comprising: valve corner spreader means positioned for insertion into the gusset of each bag near the corner thereof, said spreader means thereafter being actuated for spreading apart the valve corner to form an accessible valve flap having a valve flap extension, the spreading of the valve corner being effective to spread open at least partially the opposed walls of the tubes at the end thereof; tube end spreader means for thereafter engaging such spread opposed walls adjacent the valve flap and uniformly spreading such walls further whereby said valve flap is stretched to a preselected extent, said tube end spreader means having arms which are movable to a position behind the valve flap extension when initially moved into position; means for thereafter pressing the valve flap along a base portion thereof to form a base fold line, said arms being thereafter withdrawable for urging the valve flap extension outwardly of the bag tube; a carrier constructed and arranged to apply a supplemental sheet to each of said flaps at said sheet applying station; and a creaser movable inwardly of the spread bag tube corner and shaped to engage said sheet and valve flap to move same inwardly to restore the corner to a generally closed condition with the valve formed therein.

6. Apparatus for folding in the corners of bags to form valves and for applying supplemental sheets thereto, comprising: a plurality of clamps, each adapted for clamping a bag at an area close to the corner to be valved, means for carrying said clamps and operating same for carrying a succession of the bags from a feeding station through a plurality of intermediate stations to a release station, a creaser for forming a crease comprising a fold line diagonally of the longitudinal axis of the bag and across the valve corner, a valve spreader for spreading the valve corner of each bag to form an accessible valve flap portion, said spreading occurring at one of said intermediate stations and said valve spreader means being effective to open at least partially an end of the bag, a bag end spreader device for spreading to a preselected extent the partially opened bag end adjacent said accessible valve flap portion, whereby the latter is held in a predetermined and substantially spread condition, a valve flap press device for pressing a base portion of the valve flap portion whereby a base fold line is formed, mechanism at the next intermediate station for applying the supplemental sheet

to said flap portion, and mechanism for creasing said sheet and valve inwardly of the bag to form a fold line along what is normally to be the lower side of the valve, and means provided at said release station for releasing the bags.

7. Apparatus for forming sleeved valves in bags, having in combination: a plurality of pairs of clamp elements arranged in spaced positions for holding a succession of flattened bag tubes respectively in side-by-side relationship; a support member on which said elements are mounted; mechanism for advancing said support member step-by-step to carry the tubes from a feeding station to succeeding stations including a sleeve applying station and a discharge station; clamp element actuating devices operatively associated with said mechanism for closing each pair of elements at said feeding station and for opening same at said discharge station; and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: valve corner spreader means to spread apart the opposed walls at one corner of each tube after it is clamped at said feeding station, the latter means when actuated forming an exposed valve flap at such corner, the valve flap having a median line, a tube end spreader for opening to a preselected extent the opposed walls of the tube end at the valve corner extremity of the tube after the action of said spreader means, valve press means for pressing portions of the spread valve corner, a carrier constructed and arranged to apply a supplemental sleeve-forming sheet having a median line to each such flap at said sleeve applying station, the median lines of each flap and sheet being in alignment, and a tucking finger movable inwardly of the bag tube corner and shaped to engage along the median lines of said sheet and flap to crease same inwardly along said lines and to restore the corner to a generally closed condition with the valve formed therein.

8. In apparatus for forming sleeved valves in flattened gusseted bags, the combination comprising: a plurality of pairs of clamp elements arranged in spaced positions for holding a succession of flattened bag tubes respectively in side-by-side relationship; a support member on which such elements are mounted; mechanism for advancing said support member step-by-step to carry the tubes from a feeding station to succeeding stations including a sleeve applying station and a discharge station; clamp element actuating devices operatively associated with said mechanism for closing each pair of clamp elements at said feeding station and for opening same at said discharge station; and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: valve corner spreading means constructed and arranged for moving with the clamping means for each bag on said support member, said spreading means entering the bag gusset as the bag enters said feeding station, mechanism for actuating said valve corner spreading means and maintaining same in a bag corner spreading position at a plurality of said stations, the actuation of said valve corner spreading means forming an accessible valve flap at such bag tube corner, said flap having a median line, the spreading of said bag tube corner by said spreading means also being effective partially to open the opposed walls at the end of the bag tube to a preselected extent, a tube end spreader member for engaging such opposed walls at such end of the

bag tube and for spreading same to a preselected extent adjacent said valve flap, valve press means for pressing against said first-mentioned spreading means portions of such valve flap to form a base fold crease, a carrier constructed and arranged for applying a supplemental sleeve-forming sheet having a median line to each of said flaps at said sleeve applying station, the median lines of said flaps and sheets being positioned in alignment, and a creaser finger movable inwardly of the bag tube corner and shaped for engaging along the median lines of said sheet and flap to crease same inwardly along said lines and to restore the corner to a generally closed condition with the valve formed therein.

9. Apparatus for forming sleeved valves in flattened gusseted bags, having in combination: a plurality of pairs of bag tube clamp elements arranged in spaced relation for holding a succession of flattened bag tubes in successive side-by-side relationship; a frame member on which said elements are mounted; mechanism for advancing said frame member step-by-step to carry the bag tubes from a feeding station to succeeding stations including a sleeve applying station and a bag discharge station; clamp element actuating devices operatively associated with said mechanism for closing each pair of clamp elements at said feeding station and for opening same at said discharge station; and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: gusset spreader means for spreading apart the opposed walls of the gusset at one corner of each tube after each is clamped at said feeding station, the spreading apart of said gusset by said spreader means being effective to form an exposed valve flap and at least partially to open the tube end whereby the opposed walls thereof are spread apart, a tube end spreader member for engaging such open tube end and spreading same by a preselected amount, valve press means for pressing portions of said bag tube corner against said spreader means to form a base fold line for such valve flap, a carrier constructed and arranged for applying a supplemental sleeve-forming sheet to each of said flaps at said sleeve-applying station, a creaser movable inwardly of the bag corner and shaped to engage along a median line of said corner to cause same to be creased inwardly of the bag, and means for substantially concurrently restoring the spreading means to inactive condition, thus restoring the corner to a generally closed condition with the sleeved valve formed therein.

10. In apparatus for forming bag valves with sleeves therein, the combination of: mechanism for carrying and holding in spread condition the valve corners of a series of bag tubes to position same successively at a plurality of stations including a valve pressing station, a sleeving station, and a discharge station, mechanism operative in timed relationship with said carrying mechanism including power operated devices comprising: valve corner spreading means for spreading the corner of each bag tube, thereby forming an accessible valve flap, tube end spreader means for spreading the opposed walls of the tube end to a preselected extent adjacent said flap, valve press means for pressing a portion of said spread corner, mechanism for concurrently cutting a succession of supplemental sheets from a roll of sheet material to form the valve sleeves and to apply adhesive to an edge

thereof, and sheet applying means operative in timed relation with said carrying mechanism to take the successive severed sheets and apply the adhesive-bearing edges thereof respectively to the inside surfaces of said flaps of the successive bag tubes, sheet fold-over mechanism for folding such sheets along the edge of such accessible valve flap, hold-down fingers operative for urging said folded sheet against the edge of the accessible flap during the withdrawal of sleeve applying means, and a creaser finger movable inwardly of the bag tube corner and shaped for engaging along a median line of said sheet and flap to cause same to be creased inwardly along said line and to restore the corner to a generally closed condition with the valve formed therein and with said sheet folded along said line within the valve.

11. Apparatus for forming sleeved valves in flattened gusseted bags, having in combination: a plurality of pairs of clamp elements arranged in spaced positions for holding a succession of flattened bag tubes in successive side-by-side relation; a support member on which said elements are mounted; mechanism for advancing said support member step-by-step to carry the tubes from a feeding station to succeeding stations including a sleeve applying station and a discharge station; clamp element operating devices operative in timed relation with said mechanism for closing each pair of clamp elements at said feeding station and for opening same at said discharge station to permit discharge of the tubes; and power operated devices operatively interconnected to act in timed relation with said step-by-step mechanism, said devices comprising: valve corner spreader means positioned for insertion into the gusset of each bag near the corner thereof when clamped by its respective clamp element, said spreader means thereafter spreading apart the valve corner to form a valve portion having an accessible valve flap and a fold line at the base thereof, the spreading of the valve corner also partially spreading open the opposed walls of the tube end, tube end spreader means for thereafter engaging such spread opposed walls adjacent the valve flap and uniformly spreading such walls further for increasing the tautness of the valve portion along said fold line, a valve press for thereafter pressing the valve portion along such fold line thereof to form there a positive crease, a carrier constructed and arranged to apply a supplemental sleeve forming sheet to each of said flaps at said sleeve applying station, and a creaser movable inwardly of the bag tube corner and shaped to engage along a median line of said sheet and valve portion substantially perpendicular to said base fold line to crease the sheet and valve portion inwardly to restore the corner to a generally closed condition with the valve and sleeve formed therein.

12. Method for forming valves in paper bag tubes which consists in: carrying the bag tubes in succession past a plurality of stations; gripping each tube at a first station at an area near the corner thereof; thereafter spreading the corner to present an accessible valve flap by a spreader device having a pair of spreadable wings; pressing a base portion of the flap along a base fold line against said wings to form a valve flap base fold crease along substantially the entire length of said base fold line; thereafter creasing the valve inwardly to restore

the corner to a closed condition; and thereafter releasing the tube.

13. Method for forming valves in flattened gusseted paper bag tubes and introducing supplemental sheets to form valve sheets therein which method comprises: carrying the bag tubes in close succession side-by-side, each along the same path and step-by-step past a plurality of stations; thereafter gripping the tube at a subsequent station, thereby holding the gusset closed; thereafter spreading apart the gusset so gripped, the spreading of said gusset causing the bag corner to spread and present an accessible valve flap having a base fold line; pressing said valve flap along substantially the entire length of such base fold line thereof between two pressure surfaces to form a base fold crease; retaining the spread bag tube corner parts substantially in such spread condition to expose such flap at a subsequent station and there applying an adhesive bearing edge of a supplemental sheet to said flap; thereafter creasing the flap and sheet along a median line inwardly in a plane substantially perpendicular to said base fold line to restore the corner to a generally closed condition with the valve formed therein and with the sheet folded along such line; and finally at a release station releasing the tube.

14. Method for forming valves in flattened gusseted paper bag tubes and introducing supplemental sheets to form valve sleeves therein, the method comprising: carrying the bag tubes in succession side-by-side, each along the same path, and step-by-step past a plurality of stations; gripping each tube at a first station at an area near the corner, thereby holding the gusset closed at such area; thereafter spreading apart the gusset adjacent said corner and causing the corner to spread and present an accessible valve flap having a median line and a base fold line; pressing a base portion of said valve flap along such line between two pressure surfaces to form a base fold crease substantially perpendicular to the median line thereof and along substantially the entire length of such base fold line; retaining said valve flap in an accessible position until the tube is moved to a subsequent station and there applying a supplemental sleeve forming sheet; and thereafter creasing the valve and sheet along the median line inwardly to restore the corner to a closed condition with the valve formed therein and the sheet folded along said median line within the valve.

15. Apparatus for forming sleeved valves in bags, having in combination, a plurality of pairs of clamping elements arranged at angularly spaced and generally radial positions about a central axis for holding a succession of flattened bag tubes respectively along angularly spaced planes extending outwardly of such axis, a frame on which said elements are mounted, mechanism for rotating said frame step-by-step about such axis to carry the tubes from a feeding station to succeeding stations including a sleeve applying station and a discharge station located around such axis, clamp-operating devices operative in timed relation with said step-by-step mechanism for closing each pair of clamp elements after arrival at said feeding station and for opening same to permit discharge of the tubes at said discharge station, and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: spreader means to spread apart the opposed walls at one cor-

ner of each tube after it is clamped at said feeding station and prior to arrival at said sleeve applying station, to form an accessible valve flap at such corner, a carrier constructed and arranged to deposit a supplemental sleeve forming sheet bearing adhesive, against each of said flaps at said sleeve applying station, and a creaser thereafter movable inwardly of the bag tube corner and shaped to engage along the median line of said flap and sheet to cause same to be creased inwardly along said line and to restore the corner to a generally closed condition with the valve formed therein and with said sheet folded along such line within the valve.

16. Apparatus for forming sleeved valves in bags, having in combination, a frame structure constructed and arranged with clamps thereon for carrying a succession of flattened bag tubes in positions corresponding to the positions of paddles on a paddle wheel, mechanism for rotating said structure step-by-step whereby each bag tube is momentarily positioned at each of a succession of angularly spaced stations, clamp actuating devices operatively connected to said mechanism to close said clamps at the first station and to release same at a release station, and power-operated mechanisms operatively connected to act at said stations in timed relation with said step-by-step mechanism, said mechanisms comprising: means constructed and arranged to successively convey the bag tubes flatwise and radially inwardly of the frame structure to bring a longitudinal edge of each into a predetermined position in the clamps at the first station, spreaders to separate the opposed walls at one corner of each tube at the next station to thereby form an accessible valve flap at such corner, a carrier constructed and arranged to deposit a supplemental sleeve forming sheet against each of said flaps at a subsequent station, a creaser constructed and arranged to cause folding of said flap and sheet inwardly of the bag corner along substantially a median line of the flap, and means to convey the released tubes flatwise from the final station.

17. Apparatus for forming sleeved valves in bags, having in combination, a frame structure constructed and arranged with clamps thereon for carrying a succession of flattened bag tubes in positions corresponding to the positions of paddles on a paddle wheel, mechanism for rotating said structure step-by-step whereby each bag tube is momentarily positioned at each of a succession of angularly spaced stations, clamp actuating devices operatively connected to said mechanism to close said clamps at the first station and to release same at a release station, and power-operated mechanisms operatively connected to act at said stations in timed relation with said step-by-step mechanism, said mechanisms comprising: means constructed and arranged to successively convey the bag tubes flatwise and radially inwardly of the frame structure to bring a longitudinal edge of each into a predetermined position in the clamps at the first station, spreaders to separate the opposed walls at one corner of each tube at the next station to thereby form an accessible valve flap at such corner, a carrier constructed and arranged to apply an edge of a supplemental sleeve forming sheet against the inner surface of each flap at a subsequent station and temporarily to hold such edge in position, a folding device on such carrier to hold remaining parts of such sheet against the outside of the flap, a creaser constructed and ar-

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ranged to cause folding of said flap and sheet inwardly of the bag corner along substantially a median line of the flap, and means to convey the released tubes radially outwardly and flatwise from the final station.

18. Apparatus for forming valves in bags, having in combination, a frame structure constructed and arranged with clamps thereon for carrying a succession of flattened bag tubes in positions corresponding to the positions of paddles on a paddle wheel, mechanism for rotating said structure step-by-step whereby each bag tube is momentarily positioned at each of a succession of angularly spaced stations, the bag tubes being positioned horizontally flatwise at the first and last stations, clamp actuating devices operatively connected to said mechanism to close said clamps at the first station and to release same at a release station, and power operated mechanisms operatively connected to act at said stations in timed relation with said step-by-step mechanism, said mechanisms comprising: means constructed and arranged to successively convey the bag tubes flatwise and radially inwardly of the frame structure to bring a longitudinal edge of each into a predetermined position in the clamps at the first station, spreaders to separate the opposed walls at one corner of each tube at the next station to thereby form a generally flattened valve flap at such corner, a creaser constructed and arranged to cause folding of said flap inwardly of the bag corner along substantially a median line of the flap, and means to convey the released tubes flatwise from the last station.

19. Apparatus for forming sleeved valves in bags, having in combination a plurality of pairs of clamping elements arranged in spaced positions for holding a succession of flattened bag tubes respectively in side-by-side relation, a frame on which said elements are mounted, mechanism for advancing said frame step-by-step to carry the tubes from a feeding station to succeeding stations including a sleeve applying station and a discharge station, clamp-operating devices operative in timed relation with said mechanism for closing each pair of clamp elements after arrival at said feeding station and before arrival at a sleeve applying station and for opening same to permit discharge of the tubes at said discharge station, and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: spreader means to spread apart the opposed walls at one corner of each tube after it is clamped after arrival at said feeding station and prior to arrival at said sleeve applying station, to form an accessible valve flap at such corner, a carrier constructed and arranged to apply a supplemental sleeve forming sheet to each of said flaps at said sleeve applying station, and a creaser movable inwardly of the bag tube corner and shaped to engage along the median line of said flap and sheet to cause same to be creased inwardly along said line and to restore the corner to a generally closed condition with the valve formed therein and with said sheet folded along such line within the valve.

20. In apparatus for inserting supplemental sheets to form sleeves in valve bags, the combination of means for holding successive bags with a valve corner spread to present an accessible flap area, a sheet carrier reciprocable toward and away from such corner for applying a supplemental sheet to such area, power driven mechanism operatively connected to act in timed relation to

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movements of said reciprocable carrier for automatically applying a sheet to said carrier during each time that same is retracted, gripping fingers pivotally mounted on said carrier for gripping the side edges of each sheet adjacent its forward end, and means for actuating said fingers in timed relation to the reciprocation of said carrier, whereby said fingers hold the sheet in position on the carrier during its advancing stroke and release the sheet prior to the retraction of the carrier.

21. Apparatus for forming sleeved valves in flattened gusseted bags, having in combination, a plurality of pairs of clamp elements arranged at angularly spaced and generally radial positions about a central axis for holding a succession of flattened bag tubes respectively along angularly spaced planes extending outwardly of such axis, a support member on which said elements are mounted, mechanism for angularly shifting said support member step-by-step about such axis to carry the tubes from a feeding station to succeeding stations, including a sleeve applying station and a discharge station, clamp element operating devices operative in timed relation with said mechanism for closing each pair of clamp elements after the arrival thereof at said feeding station and for opening same to permit discharge of the tubes at said discharge station, and power operated devices operatively connected to act in timed relation with said step-by-step mechanism, said devices comprising: gusset spreader means to spread apart the opposed walls of the gusset at one corner of each tube after it is so clamped after arrival at said feeding station and prior to its arrival at said sleeve applying station to form an exposed and substantially spread valve flap at such corner, a carrier constructed and arranged to deposit a supplemental sleeve forming sheet against each of said flaps at said sleeve applying station, said flap and sheet so deposited having aligned median lines, and a creaser thereafter movable inwardly of the spread bag tube corner and shaped to engage along the median lines of said flap and sheet to cause same to be creased inwardly along said lines and to restore the bag tube corner to a generally closed condition with the valve formed therein and with said sheet folded along such line within the valve, said spreader means being movable to a closed condition concurrently with the creasing inwardly of said flap and sheet by said creaser.

22. In apparatus for forming bag valves with sleeves therein, the combination of: mechanism for carrying and holding in spread condition the valve corners of a series of bag tubes to position same successively at a plurality of stations including a valve flap spreading station, a sleeving station, and a discharge station, power operated mechanism operative in timed relation with said carrying mechanism including: valve corner spreading means for spreading the corner of each bag tube, thereby forming an accessible valve flap; mechanism for concurrently cutting a succession of supplemental sheets from a strip of sheet material to form the valve sleeves, such cutting mechanism including an edge notch cutter for making a relatively short edge notch cut extending in such strip from an edge thereof in a direction which is diagonal to the longitudinal axis thereof, and a cross cutter for making a relatively longer cross cut in such strip extending from the inner extremity of such notch cut across the strip to the opposite edge thereof in a different direction compared to the first cut, said

cross cut extending in a direction slightly divergent from a line perpendicular to the longitudinal axis of such strip; sheet applying means operative in timed relation with said carrying mechanism to apply the leading edges of sheets held thereon respectively to the inside surface of said flaps of the successive bag tubes; sheet foldover mechanism for folding such sheets so applied along the edge of such accessible valve flap; and a creaser finger movable inwardly of the bag tube corner and shaped for engaging along a median line of said sheet and flap to crease same inwardly along said line to restore the corner to a generally closed condition.

23. In apparatus for forming bag valves with sleeves therein, the combination of: mechanism for carrying an holding in spread condition the valve corners of a series of bag tubes to position same successively at a plurality of stations including a valve flap spreading station, a sleeving station, and a discharge station, power operated mechanism operative in timed relation with said carrying mechanism including: valve corner spreading means for spreading the corner of each bag tube, thereby forming an accessible valve flap; mechanism for concurrently cutting a succession of supplemental sheets from a strip of sheet material to form the valve sleeves, such cutting mechanism including a notch cutter and a cross cutter positioned respectively for forming a relatively short notch-cut at one edge of the strip at an angle of the order of 40-50 degrees to the center line of such strip, and for forming a cross cut to complete the cut to the opposite edge of the strip, such cross cut being slightly divergent from a line perpendicular to the center line of the strip; sheet applying means operative in timed relation with said carrying mechanism to apply the leading edges of sheets held thereon respectively to the inside surfaces of said flaps of the successive bag tubes; sheet foldover mechanism for folding such sheets so applied along the edge of such accessible valve flap; and a creaser finger movable inwardly of the bag tube corner and shaped for engaging along a median line of said sheet and flap to crease same inwardly along said line to restore the corner to a generally closed condition.

24. In apparatus for forming bag valves with sleeves therein, the combination of: mechanism for carrying and holding in spread condition the valve corners of a series of bag tubes to position same successively at a plurality of stations including a valve flap spreading station, a sleeving station, and a discharge station, power operated mechanism operative in timed relation with said carrying mechanism including: valve corner spreading means for spreading the corner of each bag tube, thereby forming an accessible valve flap; mechanism for concurrently cutting a succession of supplemental sheets from a strip of sheet material to form the valve sleeves, such cutting mechanism including means for forming a fillet upon a leading edge corner of each sheet and for forming a cross cut from such fillet across the sheet along a line which is divergent from a line perpendicular to the center line of the strip of sheet material; sheet applying means operative in timed relation with said carrying mechanism to apply the leading edges of sheets held thereon respectively to the inside surfaces of said valve flaps of the successive bag tubes; sheet foldover mechanism for folding such sheets along the edge of such accessible valve flap after such sheets have been so applied by said sheet applying

means; and means for restoring the corner of each bag tube to a generally closed condition.

25. In apparatus for valving flattened gusseted bags, the combination comprising a structure including power driven means for advancing same for carrying a continuing succession of the bags through a series of stations where successive valving operations are performed on each bag, said structure carrying a plurality of clamping devices operatively connected to act in timed relation to said power driven means to grip each bag at a feeding station and to retain same as it passes said stations to a release station, such bags being feedable flatwise with a gusseted edge entering into a clamping device at the feeding station, a like plurality of valve corner spreading devices each mounted for moving with a respective clamping device, one spreading device for each bag on said structure, one of said spreading devices entering the bag gusset as the bag enters said feeding station, stop means adjustable in position in accordance with the depth of the bag gusset for engaging said bag edge and stopping each bag as it enters said feeding station, at a position whereby a spreading device will enter the gusset to a predetermined depth, mechanism for actuating said spreading devices and maintaining same in bag corner spreading position at a plurality of said stations, a creaser movable inwardly of the bag corner at an intermediate station and shaped to engage along a median line of said corner to cause same to be creased inwardly of the bag, and means for restoring the spreading devices to inactive condition substantially concurrently with such inward movement of said creaser, thus restoring the corner to a generally closed condition with the valve formed therein.

26. Apparatus for forming valves in flattened gusseted bags, having in combination, a frame structure constructed and arranged with a plurality of pairs of clamps thereon for carrying a succession of flattened gusseted bag tubes in positions corresponding to the paddles on a paddle wheel, mechanism for rotating said structure step-by-step whereby each bag tube is momentarily positioned at each of a succession of angularly spaced stations, including a feeding station and a release station, clamp actuating devices operative to close said clamps at the feeding station and to release same at the release station, a conveyor device constructed and arranged successively to convey the bag tubes radially inwardly of said frame structure to bring a longitudinal edge of each tube into a preselected position in its respective pair of clamps at the feeder station, a like plurality of spreader devices adjacent the respective clamps for separating the opposed gusset walls at one corner of each tube at the next station, thereby to form a generally spread and exposed valve flap at such corner, a creaser device positioned for folding said flap inwardly of the bag corner substantially along a median line thereof, and a bag discharge device for conveying away the released tubes from the release station, said devices being operable in timed relation with the movement of said frame structure.

27. Apparatus for forming valves in gusseted paper bag tubes comprising: a clamp for gripping each tube at an area near a corner of such tube; a spreader device having a pair of wings spreadable within such gusset near such corner of the bag tube to form an accessible valve flap; a valve press ram; mechanism for moving said valve

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press ram in timed relationship with said spreader device for engaging and pressing a base portion of such accessible valve flap along a line thereof comprising a base fold line against said wings of said spreader device to form a valve flap base fold crease along a substantial part of such base fold line; and a tucking blade movable in timed relation with said device for engaging said valve flap and tucking same inwardly to restore such corner to a closed condition.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date	
925,296	Clausen	June 15, 1909	15

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Number	Name	Date
1,290,555	Heppes	Jan. 7, 1919
1,351,219	Rose	Aug. 31, 1920
1,650,895	Kronmiller	Nov. 29, 1927
1,745,312	Oman	Jan. 28, 1930
1,775,829	Potdevin	Sept. 16, 1930
1,916,293	Andreas	July 4, 1933
1,949,879	Potdevin	Mar. 6, 1934
2,205,633	Sharkey	June 25, 1940
2,378,285	Countryman	June 12, 1945
2,387,274	Lee	Oct. 23, 1945
2,442,431	Peters	June 1, 1948
2,483,860	Vredenburg	Oct. 4, 1949
2,559,873	Grupe	July 10, 1951