Sept. 19, 1967 G. CAMERINI 3,342,480

ALIGNMENT MECHANISM

Filed March 4, 1965

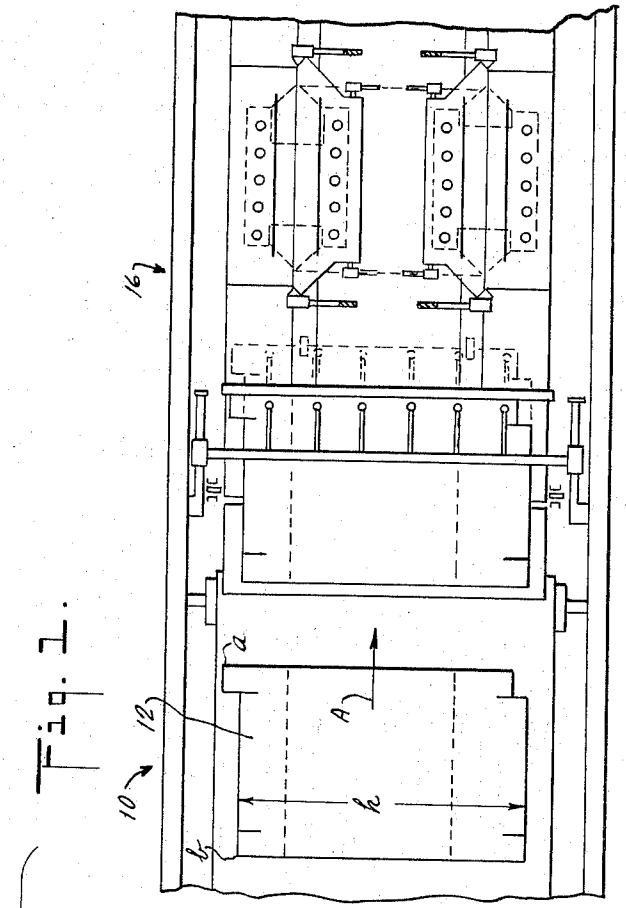


Fig. 1.

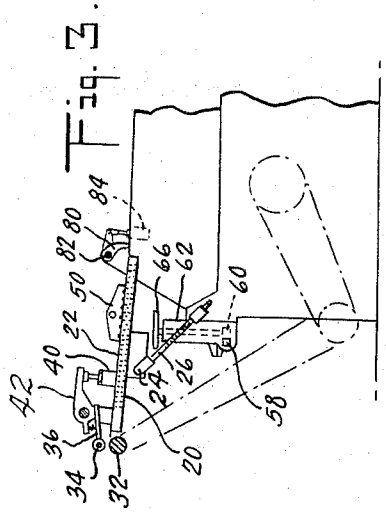


Fig. 3.

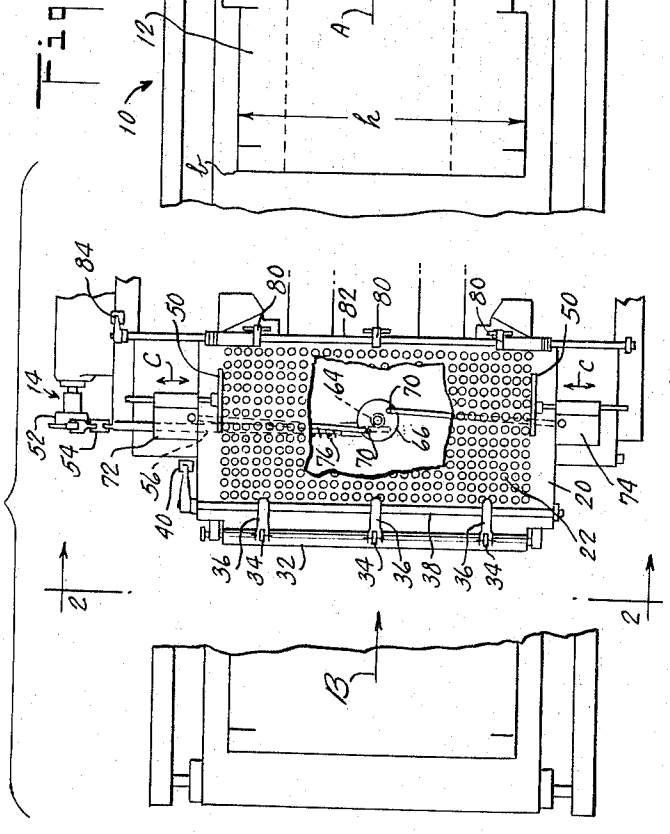
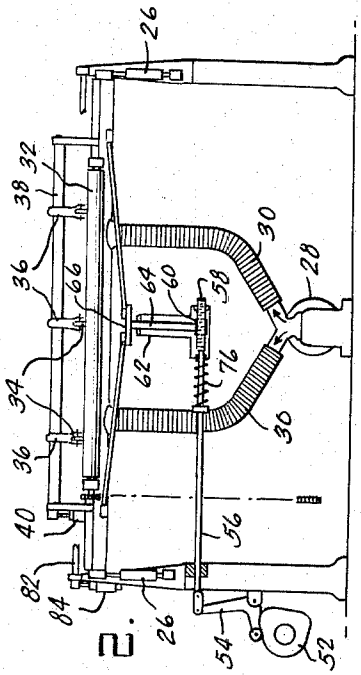


Fig. 2.



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ALIGNMENT MECHANISM

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9 Claims. (Cl. 271—58)

This is a continuation-in-part of copending applications, Ser. No. 368,162, filed May 18, 1964, and Ser. No. 370,451, filed May 27, 1964, now abandoned.

This invention relates to improvements in apparatus for forming bag closures, and is especially suited for use in connection with apparatus of the type shown and described in the above identified copending applications. In such apparatus, bags are made from plastic or similar non-rigid, non-creasable sheet materials. These bags are of the "block bottom" type. That is, their end closures comprise side and corner closure flaps which are folded inwardly and secured in superposed relation.

In the forming of paper bags, or bags of similar material, there is no particular difficulty involved in the centering, trueing and lining-up of the bag blanks during the feeding and the transferring operations. This is because the materials involved are relatively stiff and light and thus do not tend to curl or wrinkle. Also such materials usually have a low friction coefficient and may easily be slid over their supporting surface without becoming distorted. Thus ordinary mechanical means acting on the edges of the bag blanks have been adequate for all alignment purposes where the blanks were made of paper and paper-like materials.

Where, however, the bag blanks are of a relatively limp material as, for example, a plastic material or equivalent, the conventional mechanical arrangements which are used for centering and lining-up bag blanks made of a more stiff or rigid material, such as paper, cannot be used. This is due to the fact that the relatively limp material will either bend or pleat; and, in any case, will collapse under the pushing action of the centering and/or lining-up means.

Also, it is particularly important that special care be taken in the centering and lining-up of bag blanks made with a relatively limp material, for the various operations involved in the formation of bag ends depend for their accuracy and good execution upon the precision with which the bag blanks are aligned as they undergo these operations.

The present invention provides a novel arrangement for centering and lining-up bag blanks for proper feeding to the next station of a bag forming apparatus. This novel arrangement moreover is applicable for use with bag blanks of soft plastic or similar materials.

According to the invention, each individual bag blank is subjected to the action of a specially directed air stream which creates and maintains an air cushion between the bag blank and its supporting base so that the bag blank will not encounter any frictional resistance on the base. It can thus be easily centered and lined-up by suitable means acting on its edges to push it in any desired direction.

More in particular, the centering and lining-up device, according to the invention, includes a support element formed with a porous plane surface which is adjustable in inclination. Suitable means are provided to blow a continuous air stream through the porous plane surface of

the support element. The width of this air stream is sufficiently large to act uniformly over the entire under surface of the bag element; and it is sufficiently strong to create a supporting air cushion between the bag blank and the support element. Centering and lining-up means are provided to act on the edges of the bag blanks in order to shift them in one or the other direction, according to the particular offset of each blank itself, such centering and lining-up being done while the bag blank is positioned over the porous plane surface and while it is subject to the action of the air stream.

According to one aspect of the invention, the centering means advantageously comprises two opposed elements each adapted to act on one transverse edge of a bag blank. These elements are movable between a first inactive position, in which they are displaced from the transverse edges of the bag blank, to a second active position, in which they act upon such transverse edges. These elements also are arranged such that when they are in their second position, the distance between them is slightly less than the transverse length to the bag blank and centered with respect to the final desired position of the bag blank, so that during its passage between the opposed movable elements, it becomes pushed by one or the other element, according to its offset, until it nearly assumes its final centered position. Then, due to the further combined approaching action of the two movable elements, the blank becomes slightly buckled or deformed in the direction of its longitudinal axis. When it is thereafter released, by the movement of the elements from their second to their first position, it will be perfectly centered. The shifting movement of the blank from its original offset position to a final centered position is carried out in a very smooth and uniform manner since, because of the air cushion, there is an almost total lack of frictional resistance between the bag blank and the surface of the support element under it.

According to a further aspect of the invention, the lining-up means includes one or more aligned front stop members along which the forwardmost edge of the bag blank comes to rest in a very uniform and even manner. This action is made possible by the inclination of the porous plane surface of the support element, which, in cooperation with the essentially friction-free air cushion between the support element and the bag blank serves to induce the blank to slip easily and lightly up against the aligned front stop members.

Various further and more specific objects, features and advantages of the invention will appear from the specification given below, taken in connection with the accompanying drawings, illustrating by way of example a preferred form of the invention.

In the drawings:

FIG. 1 is a plan view, partially cut away of a position of a bag forming machine utilizing the present invention;

FIG. 2 is a view taken along line 2—2 of FIG. 1; and

FIG. 3 is a side view of the apparatus as shown in FIG. 2.

FIG. 1 shows a portion of a bag making machine **10** of the type described in my aforementioned copending applications. In this machine, precut tubular bag blanks **12** are conveyed along individually in the direction of the arrow A. During their movement along the machine, they first pass through an alignment station **14** where they are aligned and centered with respect to the sides of the machine. Thereafter the blanks pass through an opening station **16** where their end closures are formed in a manner described in said copending applications.

The effectiveness of operation of the opening station depends in great part upon the precision with which the individual blanks are fed into it. Thus the alignment sta-

tion **14** described more fully below, is of considerable importance to the overall operation of the machine **10**.

As shown in FIGS. 1–3, the alignment station **14** includes a support plate **20**, having a porous upper surface **22**. The support plate is pivotally mounted as at **24** (FIG. 3) and its angle of inclination may be controlled by adjustment of a turnbuckle **26** connected between the support plate and the base of the machine **10**. A fan **28** (FIG. 2) is mounted under the support plate and connected by means of a pair of hoses **30** to blow air up through the support plate **20** and out along its entire porous upper surface **22**.

A transversely extending drive roller **32** is mounted immediately ahead of the frontal or upstream edge of the support plate and is driven continuously by means of a drive motor (not shown), in the direction of the arrow B, so as to tend to urge the individual bag blanks up onto the support plate **20**. A set of guiding rollers **34** are mounted on arms **36** which in turn are attached to a common shaft **38** also extending transversely across the machine. Suitable means, such as a piston and cylinder assembly **40** are connected via a crank arm **42** to rotate the shaft **38** so as to move the arms **36** to bring the guiding rollers **34** down upon the roller **32**. This develops a pinch effect between these rollers so that a bag blank which approaches them is drawn between them and is driven up onto the support plate **20**.

The alignment station **14** includes a centering mechanism. This centering mechanism includes a pair of paddles **50** arranged in conjunction with a linkage system to be driven toward and away from each other. The linkage system is operated by means of a cam **52** which is synchronized with the overall machine operation. More particularly, the cam **52** moves a bellcrank **54** which, in turn, drives a stay rod **56**. On the extremity of the stay rod **56**, there is provided a rack **58** which meshes with a gear **60**. The gear **60** is supported by and housed within a casing **62** attached to the machine **10**. A shaft **64**, also rotatably mounted in the casing **62**, interconnects the gear **60** and a disk plate **66**. A pair of rods **68** are pivotally connected at one end thereof to displaced points **70** on the disk plate **66**. The opposite ends of these rods are connected to sliding blocks **72** and **74** on which are supported the paddles **50**. A suitable return spring **76** cooperates with the stay rod **56** and operates to return the centering system to its original position after the cam **52** moves back from the bellcrank **54**.

From the above, it will be seen that the action of the cam **52** on the bellcrank **54** causes the linkage system to shift the paddles **50** toward and away from each other as indicated by the arrows C. The linkage system is arranged such that when the paddles are at a position of maximum mutual displacement, the distance between them is greater than the transverse length of the bag blanks (as indicated by *h* in FIG. 1). On the other hand, when the paddles reach a position of minimum mutual displacement, the distance between them is slightly less than the transverse length of the blanks. Suitable members, not shown, are provided to adjust the relative position of the paddles **50** with respect to their respective sliding blocks **72** and **74**, thus allowing an adjustment of the distance of the paddles in accordance with the transverse length of the particular bag blanks being processed.

The alignment station **14** further includes an alignment mechanism. This comprises a plurality of stop members **80** assembled on a transversely extending shaft **82**. The shaft **82** is rotatable by means of a piston arrangement **84** so as to move the stop members from a first position as shown, where they engage the front edge of a bag blank and hold it in aligned position during centering, to a lifted second position where they allow the bag blank to pass through toward the opening station **16**.

During operation of the apparatus, the precut bag blanks, as shown, are individually fed by means of a suitable feeding device (not shown), to the roller **32**. At the same time, the guiding rollers **34** are lowered by means of various synchronizing mechanisms of the machine **10**. The guiding rollers **34** and the roller **32** then cooperate to feed a bag blank onto the support plate **20** so that it covers the porous surface **22** of the plate. Due to the air stream caused by the fan **28** and which filters through the porous surface **22**, an air cushion is developed between the bag blank and the surface of the plate. This air cushion in effect causes the bag blank to float over the surface of the support plate. The adjusted inclination of the plate, in cooperation with the floating effect caused by this air cushion, causes the bag blank to slip down and dispose itself with one of its longitudinal edges (for example the front edge *a*—*a*) resting lightly against the stop members **80**. The stop members are, of course, in their lowered position at this instant and thus are effective both to hold the bag blank on or over the support plate and to align it on the machine **10**.

When the bag blank has thus become aligned, the centering mechanism operates to center it. It may happen, of course, that the bag blank will be fed to the plate **20** already centered. In this case, the centering mechanism merely operates without actually causing any movement of the bag blank.

In the more usual case, the bag blank will be fed offset to the center of the plate **20**. When this occurs, then depending on the direction of the offset, one or the other of the paddles **50** will act upon one of the transverse edges of the bag blank. If, for example, the bag blank is fed offset in the direction of the upper paddle of FIG. 1, then, due to the action of the cam **52** and the linkage system, this upper paddle, during its movement from inactive to active position, will act on the upper transverse edge (*a*–*b*) of the blank and will push the blank in an upward direction (as viewed in the drawing) until the blank reaches a position which corresponds substantially to the desired centered position. Such shifting is possible because the bag blank, notwithstanding the fact that it is made with a relatively limp heavy and high friction material, floats over the air cushion, and therefore, does not encounter any frictional resistance.

During the first centering step, the paddle will idle operate and will pass from its inactive to its active position. When the two paddles reach the maximum approached position, they will slightly compress the bag element in the transverse direction, this compression being due to the fact that the distance between the two paddles is slightly less than the height *h* of the bag blank itself. During the return movement of the paddles, the bag blank will spread out flat and assume a perfectly centered position with respect to the two paddles.

If desired, the cam **52** may be shaped, as shown in FIG. 2, to produce one or several short movements of the paddles in order to repeat one or more times the final centering step. This assures a more correct and perfect centering of the bag blank.

At the end of the centering step the piston arrangement **84** causes the shaft **82** to lift the stop members **80** thus allowing a transfer mechanism (not shown) to shift the now centered and aligned bag blank to the opening station.

Although a particular embodiment of the invention is herein disclosed for purposes of explanation, further modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

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

1. Apparatus for centering and aligning flattened bag blanks for processing in a bag forming machine, said apparatus comprising a support base having a porous plane surface and mounted so as to be adjustable in inclination, means for blowing a continuous stream of air through said porous plane surface, said surface extending over an area, the width of which is sufficiently large to permit the blown air to act uniformly over the entire under surface of the bag blank with sufficient intensity to create an air cushion between such bag blank and said support base, centering means and alignment means adapted to act on the edges of said bag element in order to shift its position over said support base according to its particular offset, while the bag blank is resting upon the air cushion developed by the passage of air through said porous plane surface.

2. Apparatus according to claim 1 wherein said centering means is arranged to operate subsequent to the operation of said alignment means.

3. Apparatus according to claim 1, wherein said alignment means is movable to allow the free passage of the bag element upon completion of the centering operation.

4. Apparatus according to claim 1 wherein said alignment means comprises at least one stop member arranged along one longitudinal edge of said support element, whereby a bag blank becomes aligned by the coming to rest of one of its longitudinal edges against said stop member, the almost complete lack of frictional resistance between the bag blank and the supporting element caused by the presence of the air cushion therebetween serving to promote smooth and uniform movement of said bag blank during such alignment.

5. Apparatus according to claim 4 wherein said centering means comprises a linkage system and a pair of sliding blocks each carrying a paddle adapted to cooperate with and push against one transverse edge of a bag blank, said linkage system being arranged to drive said paddles simultaneously and in synchronism with said bag forming machine.

6. Apparatus according to claim 1, wherein said centering means includes two oppositely disposed pusher elements each arranged to act on one transverse edge of a bag blank when said bag blank is positioned over the porous plane surface and under the action of the air stream blowing therethrough, and linkage means interconnecting said elements in a manner such that they are movable between a first inactive spread apart position, in which they do not engage said transverse edges, to a second active approached position in which they do engage said transverse edges, said linkage mechanism maintaining said pusher elements equally displaced from the center of the apparatus so that during their passage from their first to their second positions, one of said pusher elements, depending upon the particular offset position of the bag blank, will engage its associated transverse edge of the bag blank to push it until said bag blank assumes a centered position, such pushing being allowed by the almost total lack of frictional resistance due to the presence of an air cushion under the bag blank.

7. Apparatus according to claim 6, wherein said opposed pusher elements are displaced by an amount such that when they attain their second active and approached position, they become spaced apart by an amount slightly less than the height of said bag blanks so that a bag blank, during the combined approaching action of said two pusher elements, becomes slightly deformed in a longitudinal direction, and thereafter, upon being realized, during the passage of said elements from their active to their inactive position, said bag blank returns to a flattened condition in a perfectly centered position.

8. Apparatus according to claim 7, including cam means arranged to actuate said linkage mechanism to move said pusher elements, said cam means being constructed to cause a repeating of the approaching action of said pusher elements upon a given bag blank to improve the centering action thereof.

9. Apparatus according to claim 1 and including means for feeding bag blanks individually to the porous surface of said support element, said feeding means comprising a continuously rotating roller disposed along the frontal edge of said support element, at least one guiding roller and means mounting said guiding roller for movement to bear against said continuously rotating roller, such movement being synchronized with the various operating stations of said bag forming machine.

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BERNARD STICKNEY, *Primary Examiner.*