Apparatus for folding a flat, non-self-supporting, thermoplastic bag. An inclined support surface receives a plastic bag which is prevented from wrinkling or bunching by means of jets of compressed air directed against the top surface of the bag and optionally against a portion of the bottom surface of the bag. A reciprocating air nozzle creases the bag in the center and introduces the bag into the first of a series of folding belts.

1 Claim, 2 Drawing Figures
The present invention is directed to an apparatus for folding flat, non-self-supporting, thermoplastic bags. In the automated, high-speed production of flat, thermoplastic bags of large size, e.g., lawn and trash bags of 2- to 45-bushel capacity, difficulty has been encountered in maintaining the bags flat when they are positioned on the receiving table of standard folding apparatuses. Because of the thin wall, collapsible material from which thermoplastic bags are made, e.g., polyethylene, the bag walls do not have sufficient rigidity to ensure their positioning on conventional bag folding tables without wrinkling or bunching of the bag. Previously mechanical means have involved contacting the bag directly with a fold bar. However, because of the non-self-supporting nature and the electrical charge carried by the thermoplastic material, the bags have tended to bunch when positioned on the folding table and thereby cause the production of uneven folds when the bag is folded by a conventional folding device.

Accordingly, it is an object of the present invention to provide an improved apparatus for folding thermoplastic bags which prevents the flattened bags from bunching on the folding table.

It is another object of the present invention to provide an improved bag folding apparatus whereby the bag can be flattened on the folding table without incurring bunching and accurately aligned on the folding table.

The foregoing and other objects as may appear hereinafter are realized in a bag folding apparatus which includes a flat support surface adapted to support a flat, thermoplastic bag. An air nozzle is positioned above and adjacent the upper end of the support surface and is adapted to supply a flow of air to the upper surface of the bag supported on the support surface. An air nozzle is also positioned below and intermediate the support surface and is adapted to supply a flow of air to at least part of the lower surface of the bag. A movable air nozzle is centrally positioned above the support surface and is adapted to supply a transverse air flow to the top center portion of the bag to produce a crease in the bag. A pair of engaging belts supported by rollers are positioned adjacent the lower surface of the support surface to receive the creased portion of the bag and to complete the first fold in the bag.

In the drawings:

FIG. 1 is an elevational, schematic view of a bag folding apparatus constructed in accordance with the present invention; and

FIG. 2 is a top plan view of the bag folding apparatus of FIG. 1.

Referring now to FIGS. 1 and 2, the bag folding apparatus of the present invention includes a generally rectangular support table, designated generally 10, having a forward section 10a and a rearward section 10b. The forward section 10a includes parallel, opposed side walls 11—11 which are joined at their lower edges to the floor plate 12 of the forward section. The rearward section 10b is similarly constructed having opposed side walls 13—13 which are, in turn, joined at their lower edges to rearward floor plate 14. Both the forward and rearward support table sections are supported above floor level by means of the folder (not shown).

The forward section 10a and rearward section 10b of the support table may either be separated by a space or gap 15, or a slot may be provided in the joined floor plates 12 and 14, if desired.

The combination cutter-sealer bar 16 is positioned adjacent the front end of forward section 10a of the support table. Cutter-sealer bar 16 is pivotally mounted and adapted to engage fixed cutting and sealing anvil 17. A strip of either gusseted or ungusseted, flat, plastic tubing from a supply roll (not shown) is fed between the cutter-sealer bar 16 and the anvil 17 whereby a discrete length of the thermoplastic tube or folded film is sealed and also severed to form a separate bag 18 having a seal 19 in one end thereof. The sealed section of thermoplastic tubing defining the bag length 18 is forwarded by belts or rubber rollers (not shown) on to the support table 10.

Table 10 is inclined downwardly from the cutter-sealer bar, and its height below the cutter-sealer bar is adjustable whereby the bag will be airborne until it reaches the center portion of the support table 10. The bag then settles into contact with the floor plate sections 12 and 14 of the support table. To smooth out the thermoplastic bag 18 and prevent bunching and wrinkling, a forward air nozzle 20 is positioned between the side walls 11—11 adjacent the forward end of the front section 10a of the support table. The forward air nozzle is provided with a slot or series of holes 21 which direct an adjustable air flow in a substantially parallel direction over the floor sections 12 and 14 to smooth out the bag and also to propel the bag to the desired position, i.e., one-half of the bag resting on forward floor plate 12 and the other half of the bag resting on rearward floor plate 14. The direction of air flow can be adjusted, if desired. Since the forward end of the bag 18 has a tendency to contact the rearward floor plate 14 prematurely and thus cause bunching or irregular layout in the forward end of the bag, a secondary or lower air nozzle 22 is positioned beneath the forward section 10a of the support table and has a slot or series of holes 23 adapted to direct an adjustable air flow substantially parallel to the floor plates 12 and 14 into the slot 15 separating the forward and rearward sections of the support table. The air flow from nozzle 22, which direction of flow is adjustable, supports and straightens the lower surface of the bag and prevents premature contact with the rearward floor plate 14. Working in conjunction with the upper nozzle 20, lower nozzle 22 thus provides a floating, straightening effect, particularly for the forward end of the thermoplastic bag and insures that the bag makes firm, even, flat contact with the support surfaces 12 and 14 of the support table.

Pivotedly connected to rod 24, which is carried between sidewalls 13—13, is a centerfold air nozzle assembly, designated generally by the numeral 25. The centerfold air nozzle assembly includes a double-acting, pneumatic cylinder 26 having a piston rod 27 connected to longitudinal rod 28 which carries on its outer end the movable, transverse air nozzle 29. After the bag 18 is positioned flat on the support floors 12 and 14, a limit switch (not shown) actuates cylinder 26, thus moving the nozzle 29 down and transversely across the center of the bag 18 causing the bag to start to fold across this point and to be inserted between engaging, endless belts 30—30 located immediately below the slot 15. The endless belts are mounted on rollers 31—31. The double-acting cylinder then re-
tracts the nozzle for the next bag. The bag 18 is then conveyed to other series of belts (not shown) to produce additional folds in the bag. Should the air flow directed from the nozzle 29 be insufficient to produce engagement between the folded portion of the bag 18 and the belts 30—30, the nozzles 29 will move into direct contact with the bag and force the bag into engagement with the nip of the belts 30—30.

If desired, the lower air nozzle 22 may be omitted and a perforated or porous flow plate substituted for the solid floor plate 14 in the rearward portion of the support table. A housing (not shown) would be provided on the bottom of the modified floor plate and supplied with a source of air to permit an air flow through the porous floor plate to support the lower ends of the bag 18 in much the same manner as accomplished by air nozzle 22.

While there has been disclosed the preferred embodiment of the present invention, the invention is to be limited only by the following claims.

What is claimed is:

1. In a bag folding apparatus the combination comprising:
   a. a flat support surface having a receiving end, said surface being disposed in a substantially horizontal plane and adapted to receive at its receiving end and to support an unfolded thermoplastic bag having a flat upper and lower surface, said support surface providing a transverse slot therein at a location which coincides substantially with the middle of said bag;
   b. a first air nozzle positioned above and adjacent the receiving end of said support surface adapted to supply an air flow substantially parallel to the upper surface and over substantially the full length of a bag supported on said support surface;
   c. a second air nozzle positioned below and intermediate said support surface adapted to supply an air flow to at least a part of the lower surface of said bag through said slot which, in cooperation with the air flow from said first air nozzle prevents said bag from bunching and wrinkling;
   d. a third movable air nozzle positioned above said support surface and aligned with said slot and adapted to supply a narrow width air flow transversely to the upper surface of said bag substantially at its middle and opposite said slot to create a fold in said bag and to extend the fold through said slot; and
   e. a pair of engaging belts supported by rolls adjacent said slot to receive the folded portion of said bag and to complete the fold in said bag.

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