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Elms et al.

[11] **3,802,157**

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[54] **AERODYNAMIC BAG OPENING APPARATUS**

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[52] **U.S. Cl.** **53/385,** 53/190

[51] **Int. Cl.** **B65b 43/36**

[58] **Field of Search** 53/385, 190

[56] **References Cited**

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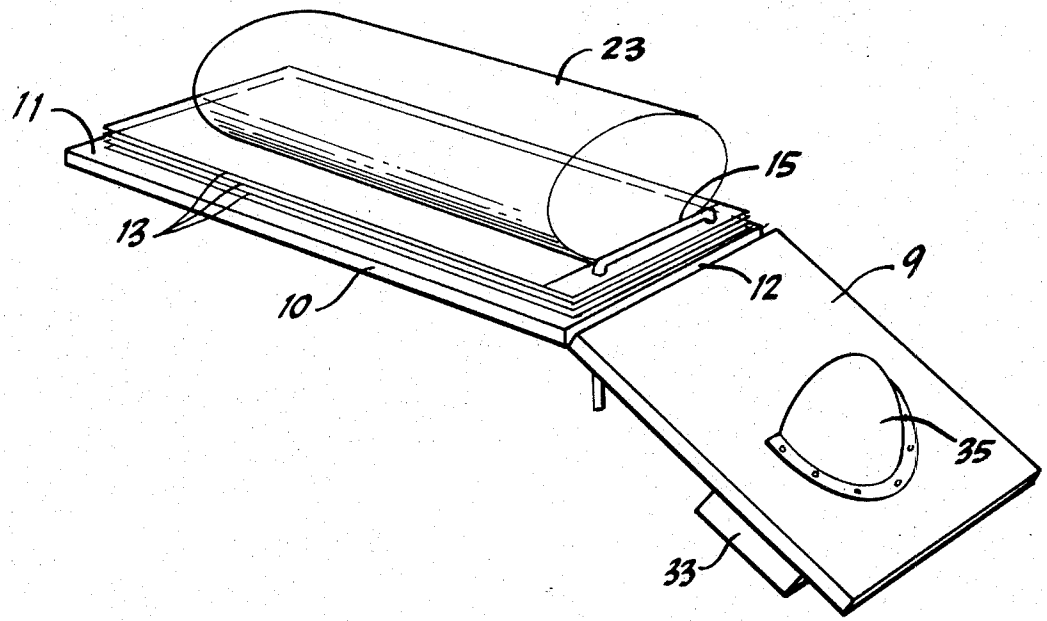
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Primary Examiner—Travis S. McGehee

[57] **ABSTRACT**

A body member has first and second surfaces which intersect, air being directed from the second surface across the intersection aerodynamically to form a region of reduced pressure above the first surface adjacent to the intersection. The first surface of the body member is adapted to receive at least one flat unopened bag the closed edges of which are opened by the region of reduced pressure to intercept the air directed from the second surface.

9 Claims, 8 Drawing Figures



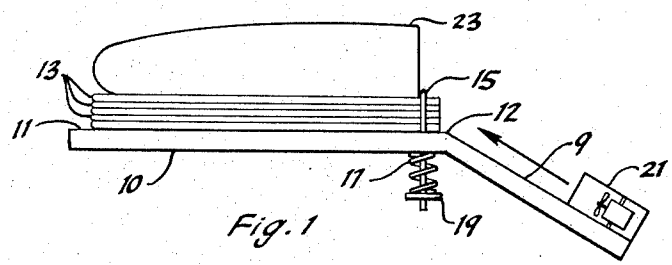


Fig. 1

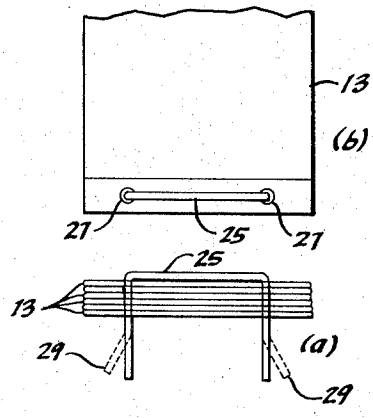


Fig. 2

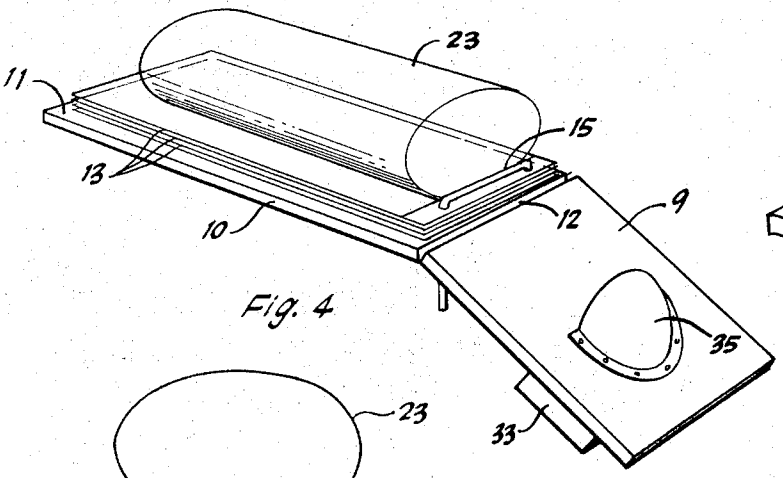


Fig. 4

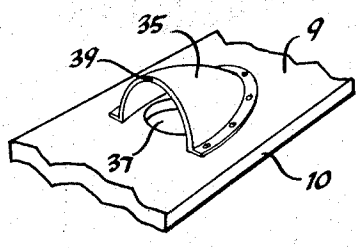


Fig. 5

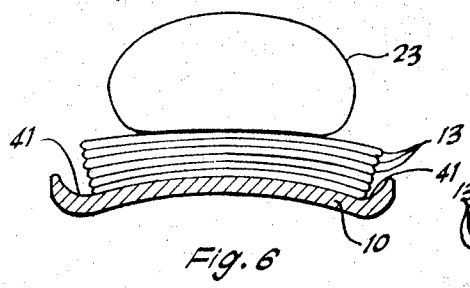


Fig. 6

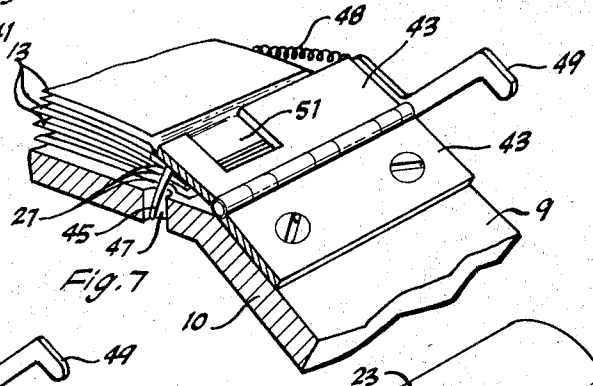


Fig. 7

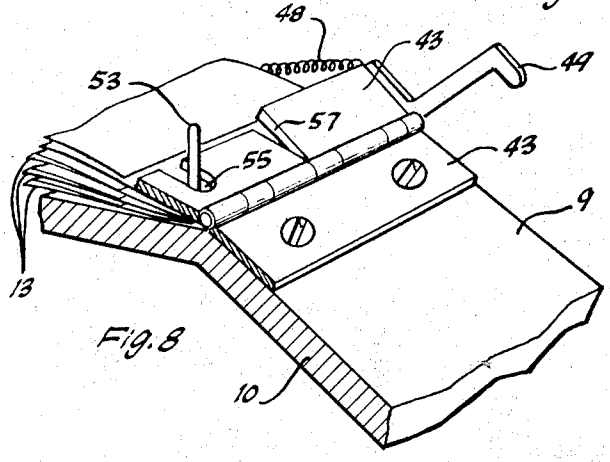


Fig. 8

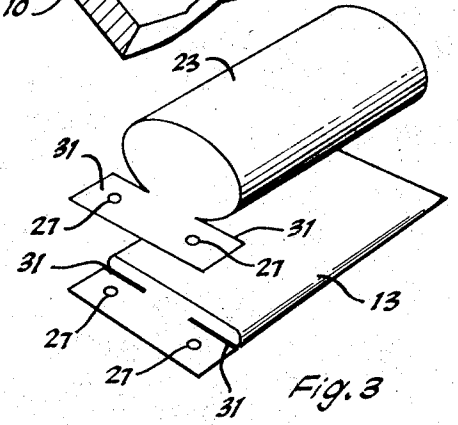


Fig. 3

AERODYNAMIC BAG OPENING APPARATUS

The present invention relates to bag opening apparatus and more particularly to a bag opening device whereby bags are opened by a region of reduced pressure formed by the aerodynamic flow of air.

In the field of bag opening apparatus, it has been the general practice to employ fans or blowers to perform the opening of bags by impinging the air stream directly on the bag openings to intercept and lift the edges of the bag to be opened. Although such devices have served the purpose, they have not proved entirely satisfactory under all conditions of service for the reason that considerable difficulty has been experienced in developing a stream of moving air to reliably separate the edges of the opening of a closed bag and difficulties encountered in sequentially opening a multiplicity of layered unopened bags.

Those concerned with the development of bag opening devices have long recognized the need for apparatus having reliable and consistent performance. The present invention fulfills this need.

One of the most critical problems confronting designers of bag opening devices has been the difficulty in sequentially opening a multiplicity of layered unopened bags, one at a time, in a dependable and repeatable manner. This problem is overcome by the present invention.

The general purpose of this invention is to provide a bag opening device which embraces all the advantages of similarly employed devices and possesses none of the afore-described disadvantages. To obtain this, the present invention contemplates a unique aerodynamic flow of air which forms an area of reduced pressure whereby the closed edges of layers of flat unopened bags consistently and reliably are separated and lifted apart in sequence to enable each bag to be further opened by directly intercepting the flow of air.

An object of the present invention is the provision of an aerodynamic flow of air for opening flat closed bags.

Another object is to provide reliable and consistent opening of a multiplicity of layered unopened bags by the aerodynamic flow of a stream of air.

A further object of the invention is the provision of a bag holding hinge for clamping and holding multiplicity of layered, unopened bags whereby the bags are consistently and reliably opened by the aerodyanamic flow of a stream of air.

Still another object is to provide a wicket holding device to secure a multiplicity of layered unopened bags whereby the edges of the bags are free to lift under the aerodynamic influence of a moving stream of air.

Yet another object of the present invention is the provision of a bag opening device having a surface thereon upon which a multiplicity of layered bags may be clamped in a manner whereby the topmost layers of bags are maintained substantially flat to prevent the premature opening by the edge of the underlayers of bags intercepting the aerodynamic flow of a moving stream of air.

Other objects and many of the intended advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which like reference

numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 illustrates a side view of the preferred embodiment of the present invention with layers of bags mounted thereon;

FIG. 2(*a* and *b*) illustrate front and top views, respectively, of a multiplicity of layered bags to be opened by the present invention which bags are engaged by a wicket holder.

FIG. 3 illustrates a pictorial view of an opened and unopened bag typical of the type to which the present invention is applied;

FIG. 4 illustrates a pictorial view of an embodiment of the present invention utilizing an air deflector and a wicket holder for the bags to be opened;

FIG. 5 illustrates a pictorial view showing detail of the air deflector illustrated in FIG. 4;

FIG. 6 illustrates a cross sectional view of the bag mounting surface having depressions to receive the edges of the bags held thereon;

FIG. 7 illustrates a cross section of a pictorial view of the present invention showing one embodiment of a hinge for holding the bags to be opened; and

FIG. 8 illustrates an alternate hinge embodiment for holding bags to be opened.

Turning now to FIG. 1, body member 10 has intersecting surfaces 9 and 11 thereon. The intersection of surfaces 9 and 11 form ridge 12. Layers of bags 13, which are to be opened, are placed on surface 11 and attached thereto by U-shaped wicket 15 which engages holes in bags 13, passes through body member 10 and is secured to body member 10 by a retaining device such as spring 17 and spring retainer 19 attached to each end of the wicket. Although not illustrated, other retaining devices are contemplated by the present invention and may take the form of a simple metal angle bracket fastened to the underside of body member 10 adjacent the wicket ends to force the wicket ends toward the bag end of body member 10 and away from the fan end of body member 10. The bending action of the bracket holds the wicket securely and forces the bags toward the fan to enhance the opening process. Fan 21 is attached to surface 9 and directs air therefrom across ridge 12 in the direction of the arrow. The moving air aerodynamically lifts the edge of the topmost bag 23 of the multilayered bags 13, causing the bag to open and intercept the directed air.

FIGS. 2(a) and 2(b) illustrate a typical set of bags 13 which are engaged by wicket 25. FIG. 2(a) illustrates an end view of layered bags 13 held by wicket 25 passing through openings in the bags. The ends of wicket 25 may be bent as illustrated by dashed lines 29 as an alternate method of holding the wicket in place on the bag opening body member 10 of FIG. 1.

FIG. 2(b) illustrates a top view of layered unopened bags 13 showing openings 27 therein through which wicket 25 is inserted.

FIG. 3 illustrates unopened bag 13 and open bag 23 typical of the type processed by the present invention. The bags have openings 27 by which they may be held by a wicket or other pinlike projections. Each bag has slits 31 to enable the bag to "balloon" and lift in response to the aerodynamic opening action of the present invention while one edge or lip of the bag opening is held securely.

FIG. 4 illustrates a pictorial view of the invention showing body member 10 and intersecting surfaces 11

and 9 with unopened layered bags 13 mounted on surface 11 and held thereon by wicket 15 adjacent ridge 12 formed by the intersection of surfaces 11 and 9. Fan 33 is mounted on the underside of body member 10 oppositely disposed to surface 9 and directs air through an opening in surface 9 (not illustrated) to intercept air deflector 35 mounted over the opening whereby air is directed across surface 9 toward ridge 12 to aerodynamically lift and intercept the topmost bag 23 of layered bags 13 thereby opening bag 23 as illustrated.

FIG. 5 shows air deflector 35 in greater detail mounted on surface 9 of body member 10. Opening 37 in body member 10 permits air to be directed from the underside of body member 10 through opening 37 to intercept air deflector 35. Air deflector 35 further has lip 39 which generates turbulence in the air issuing from deflector 35 to enhance the aerodynamic opening feature of the present invention.

FIG. 6 illustrates a cross sectional view of body member 10 showing depressions or grooves 41 thereon to receive the thick edges of the multilayered unopened bags 13 thereby permitting the topmost layers of bags to be maintained substantially flat to prevent the edges of underlying bags from prematurely intercepting moving air and being opened. Bag 23 illustrates the position of an opened bag on the top of the layers.

FIG. 7 shows a cross section of body member 10 illustrating hinge 43 fastened to surface 9. One leaf of hinge 43 is moveable and is biased by spring 48 to clamp the edges or lips of the layered bags 13. Projection 45 on the movable leaf of hinge 43 passes through one of the pair of openings 27 in the edges of bags 13 and into opening 47 in body member 10 to secure the bags to body member 10. Although only one projection 45 is illustrated, in this cross section view, another projection is provided to engage the other opening of the pair of openings 27 in bags 13. The holding or movable leaf of hinge 43 has opening 51 centrally located to allow the direct stream of air passing from surface 9 to intercept the edge of the topmost layer of bags lifted by the aerodynamic flow of air. Lever arm 49 is attached to the movable leaf of hinge 43 to enable the operator to release and insert bags thereunder.

FIG. 8 illustrates an alternate hinge arrangement wherein pin 53 is attached to body member 10 upon which pin both the multilayers of bags 13 are secured. Although there is only one pin 53 illustrated, there is another to provide a pair of pins on body member 10 to engage the pair of openings 27 in bags 13. The clamping leaf of hinge 43 has a slot 55 therein to receive pin 53. The clamping leaf of hinge 43 further has a slot 57 cut therein so that the end portion of the leaf may be bent upwards and away from the bags to release the bag edges and allow the edge of the topmost bag to move freely upward as the topmost bag is opened. Arm 49 is attached to the clamping leaf of hinge 43 to enable the operator to release and insert the layers of bags which are to be opened.

Operation of the invention can best be described by reference to FIG. 1. Fan 21 directs air across surface 9 and over ridge 12 creating a region of reduced pressure on surface 11 adjacent to ridge 12 similar to the region of reduced pressure created above an airplane wing as air moves from the leading edge over the top of the wing. This region of reduced pressure causes the edge of the topmost bag of the layers of bags 13 to be aerodynamically lifted. As the bag edge lifts, it intercepts the flow of air and is opened into the position illustrated by bag 23. Heretofore all prior art devices have utilized the direct stream of air striking the bag edges to perform the opening operation. The aerodynamic lifting of the bag edge as taught by the present invention insures each bag to be opened reliably and consistently even when the edges of the bag opening are tightly closed.

Although the present invention contemplates the use of plastic bags, other types of materials may be utilized. It is also contemplated within the scope of the present invention to use sliding rubber grommets, angle brackets, bending and other techniques and devices of a holding nature to secure the ends of the wicket bag holders when they are passed through body member 10. Threaded wickets may also be used and fastened to body member 10 by means of threaded nuts.

It now should be apparent that the present invention provides a bag opening device which may be employed in conjunction with layers of flat unopened bags for opening the topmost bag in sequence by the formation of an aerodynamically reduced pressure region over the edge of the bag opening.

Although particular components and device configurations have been discussed in connection with the specific embodiment of a bag opening device constructed in accordance with the teachings of the present invention, others may be utilized. Furthermore, it will be understood that although any exemplary embodiment of the present invention has been disclosed and discussed, other applications and apparatus arrangements are possible and that the embodiments disclosed may be subjected to various changes, modifications and substitutions without necessarily departing from the spirit of the invention.

We claim:

1. Apparatus for opening bags comprising:

a body member having at least first, second and third surfaces, said third surface having an opening therein which communicates with said second surface and through which opening moving air may be directed to said second surface, said first and second surfaces intersecting across which intersection moving air may be directed aerodynamically from said second surface to form a region of reduced pressure above said first surface adjacent said intersection, said second surface being shaped to receive and direct moving air adjacent thereto toward said intersection, said first surface being shaped to receive at least one flat unopened bag, the edges of which are separated and opened by said region of reduced pressure;

means attached to said body member for moving air through said opening in said third surface to said second surface; and means attached to said second surface for directing air from said opening in said third surface across said second surface towards said intersection to form said region of reduced pressure.

2. The apparatus for opening bags described in claim 1 wherein said directing means has an edge which produces turbulence in the movng air deflected thereby to enhance the aerodynamic formation of said region of reduced pressure.

3. The apparatus for opening bags described in claim 2 wherein said first surface further includes two longitudinal depressions therein located perpendicular to

said intersection and spaced to receive the longitudinal edges of the multiplicity of layered flat unopened bags whereby the extra thickness of the bag edges is offset to maintain the topmost layers of bag substantially flat to prevent the edges of the bags underneath the topmost bag from intercepting the direct air flow and being prematurely opened thereby.

4. The apparatus for opening bags described in claim **3** further including means to receive and hold on said body member a wicket engaging layers of flat unopened bags.

5. The apparatus for opening bags described in claim **3** further including a hinge having one leaf thereof fastened to said second surface adjacent said intersection and having a movable leaf biased to clamp and hold the edges of a multiplicity of layered unopened bags adjacent the openings thereof which may be placed upon said first surface.

6. The apparatus for opening bags described in claim **5** wherein siad movable leaf of said hinge has the outermost portions thereof formed at an angle with respect to a center portion of the leaf so that the center portion of the leaf engages and clamps the multiplicity of layered bags to the first surface and the outermost portions of the leaf do not engage the bags whereby the corners of the topmost bag adjacent said intersection are free to lift when the bag is opened.

7. The apparatus for opening bags described in cliam **5** further including an opening in the central region of said movable leaf of said hinge to enhance the opening of bags clamped thereunder by permitting the edge of the bag opening to directly intercept the flow of air after being aerodynamically lifted by said region of reduced pressure.

8. The apparatus for opening bags described in claim **7** further including pins mounted on said first surface adjacent said intersection upon which bags may be engaged and held.

9. The apparatus for opening bags described in claim **7** further including projections mounted on said movable leaf of said hinge to engage and hold bags clamped thereunder.

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