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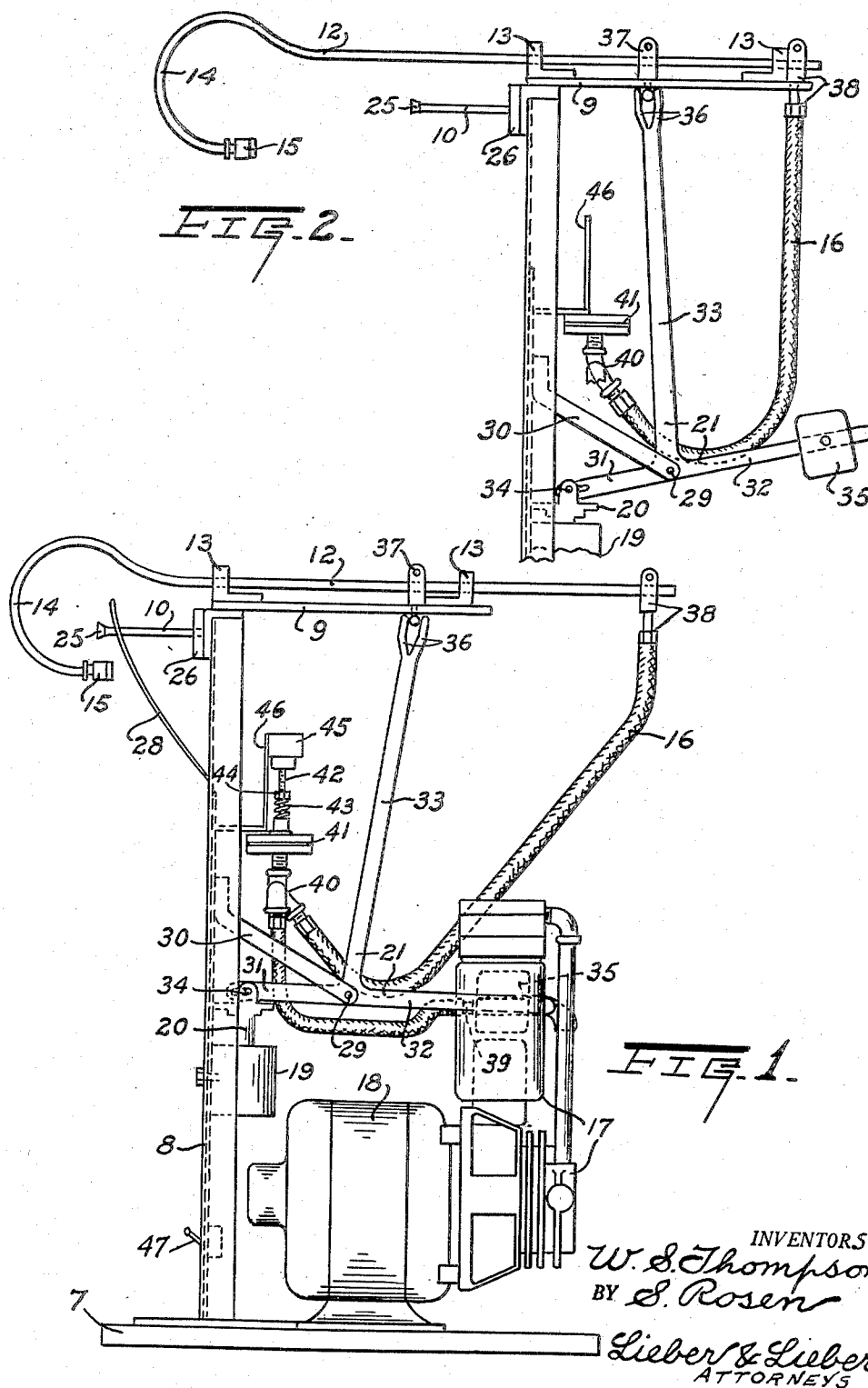
W. S. THOMPSON ET AL

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APPARATUS FOR OPENING BAGS

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2 Sheets-Sheet 1



INVENTORS
W. S. Thompson
BY S. Rosen
Lieber & Lieber
ATTORNEYS

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FIG. 3.

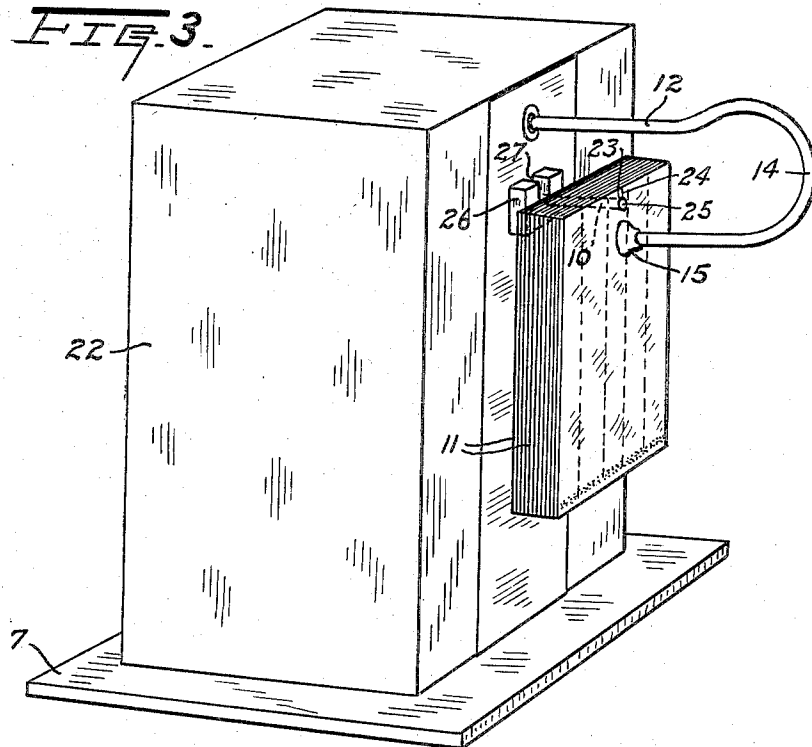
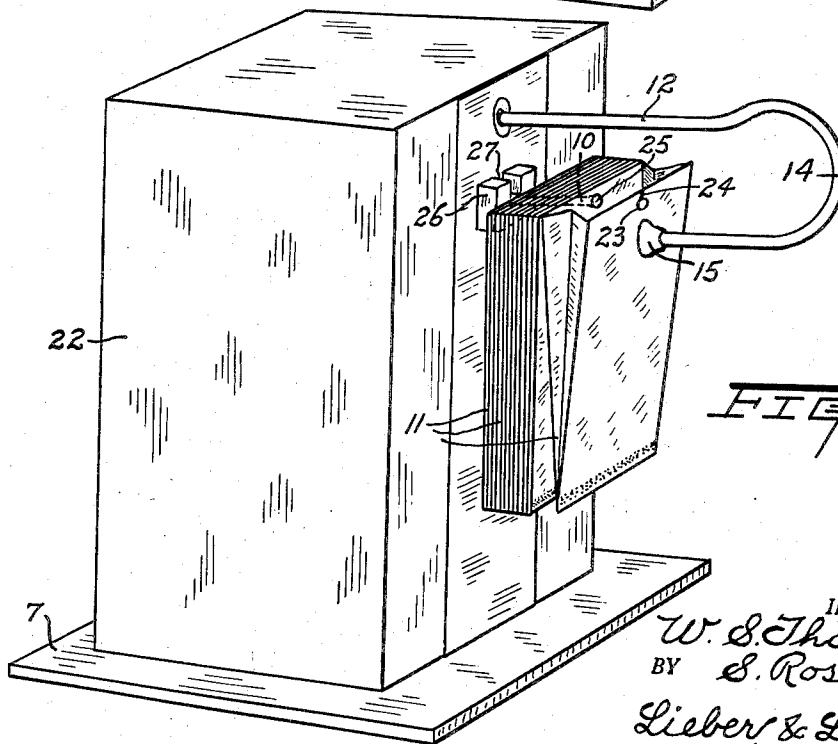


FIG. 4.

INVENTORS
W. S. Thompson
BY S. Rosen
Lieber & Lieber
ATTORNEYS.

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APPARATUS FOR OPENING BAGS

Walter S. Thompson, East Lansdowne, Pa., and Shy Rosen, New York, N. Y., assignors to Millprint, Inc., Milwaukee, Wis., a corporation of Delaware

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10 Claims. (Cl. 53—386)

The present invention relates generally to improvements in the art of packaging, and relates more particularly to the provision of an improved apparatus and method for opening and dispensing flexible bag-like containers.

A primary object of the invention is to provide a new and improved bag opening device which is highly efficient and automatic in operation and which is moreover extremely simple and economical in construction.

In the dispensation and filling of flexible commodity bags in an automatic manner, it is an extremely difficult problem to separate the adjacent bag walls so as to open the mouth portions of the bags for filling purposes. This is especially true in cases wherein the bags or bag-like containers are fabricated of certain film materials such as "polyethylene" and the like in which the walls are inclined to stick to each other because of an inherent affinity. While various devices for suspending bags and for opening the same for filling purposes have heretofore been proposed, these prior machines have all been objectionably bulky, complicated and expensive as well as slow and inefficient in operation on bags fabricated of materials inclined to stick or cling.

It is therefore a more particular object of this invention to provide bag supporting and opening device and method which obviates all of the presently existing difficulties and disadvantages.

Another specific object of the present invention is to provide a new and improved portable and automatic bag supporting and opening apparatus which is highly flexible in its adaptations and which is adapted to rapidly and effectively perform the several steps of the improved method.

Another specific object of our invention is to provide an improved simple and compact automatically operable device adapted to utilize suction in effectively opening the mouth portions of successive bag-like containers fabricated of any known flexible packaging materials and suspended from a fixed support in a given manner.

Another specific object of this invention is to provide an improved automatically operable bag supporting and opening device which is readily operable by a novice and which comprises exceedingly few parts all of which are readily accessible for inspection, replacement or repair.

Still another specific object of our present invention is to provide an improved bag opening device comprising, means forming a support, means fixedly carried by the support for suspending a bag to be opened by the mouth portion thereof, other means carried by the support for reciprocable movement relative to the bag suspension means and toward and away from one wall of the bag suspended thereby, and means for creating a suction through the reciprocably movable means for opening the bag.

A further specific object of the present invention is to provide an improved bag opening method, which comprises, fixedly suspending a bag to be opened by the mouth portion of one wall thereof, applying suction to the other wall of the suspended bag, and finally moving the

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suction applying source away from the fixedly suspended bag wall to open the bag.

These and other specific objects and advantages of the present invention will become apparent from the following detailed description.

A clear conception of the various improvements forming a part of this invention, and of the mode of operating bag opening devices manufactured in accordance therewith, as well as the steps of the improved method, may be had by referring to the drawing accompanying this specification wherein like reference characters designate the same or similar parts in the several views.

Fig. 1 is a side elevation of the mechanism of a typical bag opening machine embodying the invention and showing the reciprocable suction applying arm in fully retracted position;

Fig. 2 is a similar side elevation of the moving parts only of the device, showing the same with the suction applying arm fully extended to bag opening position;

Fig. 3 is a perspective exterior view of one of the improved machines with a plurality of bags suspended from the suspension peg and with the suction arm in inoperative retracted position; and

Fig. 4 is a similar perspective view but with the suction arm in extended bag opening position.

While the invention has been particularly described as being especially adapted for use in operating on flexible bags fabricated of certain materials and assembled in batches on a removable spindle or peg of a particular type, it is not desired or intended to unnecessarily limit the invention by virtue of such restricted embodiment; and it is also intended that certain specific descriptive terms used herein shall be given the broadest possible interpretation consistent with the disclosure.

Referring to the accompanying drawings, the improved bag opening device shown therein as embodying the improvements comprises, in general, a main supporting frame formed by a flat base 7, an upright member 8 projecting from the base 7 and a laterally extending arm 9 secured to and projecting from the upper end of the upright 8; means such as a spindle or peg 10 mounted on the main frame near the upper end of the upright support 8 and projecting laterally therefrom parallel with but in a direction opposite to the arm 9; the spindle 10 being adapted to receive a plurality of bags 11 for suspension by the mouth portions thereof as will hereafter be more fully described; means such as an elongated hollow or tubular member 12 carried by the main frame and guided for reciprocable movement longitudinally of the spindle 10 along the arm 9 as by means of a pair of guides 13, the tubular member 12 having one end thereof bent as at 14 to substantially U-shape and provided with a resilient cup-like tip 15 located below the spindle 10 adjacent to the outermost bag and the other end connected as by a flexible conduit 16 to a suitable low pressure or vacuum source shown herein as consisting of a vacuum pump 17 driven by a motor 18; and means such as a pressure actuated or pressure responsive solenoid 19 suitably secured to the upright 8 and having its plunger arm 20 connected to the tubular member 12 through suitable linkage 21 for reciprocating the member 12 in response to pressure variations within the member as will hereafter be more fully described.

The base 7, upright 8 and arm 9 of the main frame may all be fabricated of suitable sheet metal and angle irons secured together by rivets, welding or the like, and the framework and working parts may be suitably housed within a main outer casing or jacket 22. The spindle 10 preferably consists of a peg or shaft upon which a batch of the bags 11 are assembled, the stacked bags being provided with aligned apertures 23 in their walls near the

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mouth portions as shown with a corresponding wall of each bag 11 being slit as at 24 between the aperture 23 therein and the bag lip to thereby free that wall from the spindle upon application of suction thereto. The bags 11 may be conveniently assembled on the spindles 10 and merchandised in such manner, if desired, with the spindles being disposable after use; and to retain the bags properly in position, the opposite ends of the spindles or pegs 10 are flared or flanged as shown at 25 with the end of the spindle nearest to the unslitted bag walls being removably receivable in the upwardly open groove 27 of a suitable spindle or peg holder 26. If desired or found necessary, a suitable leaf spring 28 or the like may also be provided for constantly resiliently urging the suspended bags outwardly on the spindle 10 toward the adjacent end of the suction member 12, the spring 28 being secured to the upright 8 in a known manner.

The linkage connecting the tubular member 12 with the plunger arm 20 of the solenoid 19 consists of an inverted T-shaped lever 21 pivotally supported at 29 by the free end of a fixed arm 30 secured to the upright 8 so that the legs 31, 32, 33 of the lever 21 are simultaneously swingable about the pivot 29 upon movement of the solenoid plunger, the free end of the leg 31 being connected to the upper end of the plunger arm 20 by means of a pin and slot connection 34 with the free end of the leg 32 being provided with a counterweight 35 and the free end of the leg 33 being bifurcated as at 36 for sliding cooperation with a suitable coupling member 37 carried by an intermediate portion of the member 12.

The flexible conduit 16 may be formed of rubber or other flexible material and is connected at one end to the reciprocable member 12 by a suitable fitting 38 and at the other end to the suction or low pressure side of the vacuum pump 17 by another suitable fitting 39. Interposed in an intermediate portion of the conduit 16 is a T-fitting 40, the opposing branches of which are connected to the conduit 16 and the third branch of which communicates with the lower side of a diaphragm 41 to transmit pressure variations in the conduit to the diaphragm. In turn, the upper side of the diaphragm 41 has an upwardly projecting stem 42 embraced by a compression spring 43 coacting with the diaphragm casing and with an adjustment nut 44 carried by the stem 42 for constantly resiliently urging the diaphragm and its stem 42 upwardly toward a micro switch 45 which is suitably connected to the solenoid 19 in a known manner, the diaphragm and micro switch assembly being supported by a bracket 46 secured to the upright 8 of the main frame.

In operation, a spindle or peg 10 having a supply of bags 11 properly assembled thereon is inserted in the holder 26 in an obvious manner. The motor 18 is then turned on by means of a suitable switch 47 connecting the motor to a suitable source of electrical energy in a well known manner, and the motor then drives the vacuum pump 17 to thereby create a suction through the conduit 16 and the tubular member 12. With the member 12 in the position shown in Fig. 3 with the resilient cup-like tip 15 adjacent to the outer wall of the outermost bag 11, the suction within the member 12 causes the adjacent wall of the first bag to be drawn tightly against the cup 15 thereby increasing the vacuum within the member 12 and conduit 16 and below the diaphragm 41. This increased vacuum pulls the diaphragm stem 42 downwardly against the opposing pressure of the compression spring 43 and trips the micro switch 45 which, in turn, energizes the solenoid 19 and causes the plunger 20 thereof to be pulled downwardly. This downward movement of the solenoid plunger swings the triple-armed lever 21 about its pivot 29 against the opposed action of the counterweight 35 and, through the coupling 36, 37, causes the member 12 to be moved outwardly within

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its guides 13, as shown in Figs. 2 and 4, thereby drawing the free wall of the outermost bag 11 from the flared end 25 of the spindle 10 to open the bag mouth for filling and/or removal. Upon removal of the bag from the end 15 of the suction arm or member 12, the vacuum in the member 12 and conduit 16 as well as below the diaphragm 41 is decreased and the compressed spring 43 again raises the diaphragm and its stem 42 breaking the electrical contact in the micro switch 45 and causing deenergization of the solenoid 19 whereupon the lever 21 is swung clockwise about its pivot 29 by the counterweight 35 to thereby return the reciprocable member 12 to its starting position shown in Figs. 1 and 3, this cycle being constantly automatically repeated on the successive bags 11.

From the foregoing detailed description, it is apparent that an improved bag opening method is provided which comprises the steps of first fixedly suspending a plurality of bags 11 to be opened by the mouth portions of one wall of each bag, then applying a suction locally to the mouth portion of the other wall of each of the successive suspended bags, and moving the suction applying source along a rectilinear path away from the fixedly suspended wall of each of the successive bags to thereby successively open the same. The improved device is obviously simple, compact and durable and may be manufactured and sold at low cost to commodity suppliers who desire to package their commodities in a rapid and economical manner. The apparatus is of unitary construction attractively housed within a confining casing 22, and the mechanism is entirely automatic in operation and may be used in direct conjunction with automatic filling equipment by correct placement of the discharge or filling chute of the filling machine directly over the bag mouth when opened as in Fig. 4. The improved device has proven highly successful and efficient in actual operation, and the bags may be properly pegged or assembled in a simple manner by bag suppliers. It should be noted that while one wall of the bag has been shown and described as being slit at 24 for the release of such wall upon application of suction, this slit may be eliminated entirely in instances wherein the material from which the bag is fabricated is more-or-less elastic, or wherein the aperture 23 is sufficiently large to permit release of the bag mouth from the spindle.

It should be understood that it is not desired or intended to limit the invention to the exact details of construction or to the precise steps of the method herein shown and described, since various modifications within the scope of the appended claims may occur to persons skilled in the art to which this invention pertains.

We claim:

1. A bag opening device comprising, a main upright supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a bag to be opened by the mouth portion thereof, means forming a conduit carried by said frame and having one end thereof extending outwardly beyond the end of said spindle for reciprocable movement longitudinally of said spindle and toward and away from the outer wall of the bag, means for creating a suction through said reciprocably movable means during movement thereof away from the bag for opening the same, and means responsive to pressure variations in said conduit forming means for reciprocating the same.

2. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame above said spindle for reciprocable movement longitudinally of said spindle and having one end bent downwardly and inwardly toward said frame and below said spindle, said tubular member having one end thereof terminating below said spindle adjacent to the outermost bag suspended there-

from and the other end connected to a source of vacuum, and means for reciprocating said tubular member in response to pressure variations therein for opening the successive bags.

3. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by at least one wall at the mouth portion thereof, a tubular member carried by said frame above said spindle for reciprocable movement longitudinally of and in a plane parallel to said spindle, said tubular member having one end thereof bent to substantially U-shape and terminating below said spindle adjacent to the outermost bag suspended therefrom and the other end remote from said spindle connected to a source of vacuum, and means for reciprocating said tubular member in response to pressure variations therein for opening the successive bags.

4. A bag opening device comprising, a main supporting frame, a spindle removably mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, said spindle having a flared outer end for normally retaining said bags in position thereon, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof provided with a resilient cup-like tip and terminating below said spindle adjacent to the outermost bag suspended therefrom and the other end connected to a source of vacuum, and means for automatically reciprocating said tubular member solely in response to pressure variations therein for opening the successive bags.

5. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom, said spindle having a plurality of bags to be opened suspended therefrom by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating below said spindle adjacent to the outermost bag suspended therefrom and the other end connected to a source of vacuum, and a pressure actuated solenoid connected to said tubular member for reciprocating the same in response to pressure variations therein for opening the successive bags.

6. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating adjacent to the outermost bag suspended from said spindle and the other end connected to a source of vacuum, means pivotally carried by said frame and connected to said tubular member for reciprocating the same, and other means interposed in the vacuum line between said tubular member and the source of vacuum for actuating said member reciprocating means in response to pressure variations in said line.

7. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating adjacent to the outermost bag suspended from said spindle and the other end connected to a source of vacuum, an oscillatory lever carried by said frame and linked with said tubular member for reciprocating the same, and other

means interposed in the vacuum line between said tubular member and the source of vacuum and cooperable with said lever for oscillating the same in response to pressure variations in said line.

8. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating adjacent to the outermost bag suspended from said spindle and the other end connected to a source of vacuum, an oscillatory lever fulcrumed on said frame and having its swinging end cooperable with said tubular member for reciprocating the same, pressure responsive means interposed in the vacuum line between said tubular member and the source of vacuum and cooperable with said lever for swinging the same in one direction in response to a low pressure condition in said line, and other means for swinging said lever in the opposite direction when said low pressure condition does not exist.

9. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating adjacent to the outermost bag suspended from said spindle and the other end connected to a source of vacuum, an oscillatory lever fulcrumed on said frame and having its swinging end cooperable with said tubular member for reciprocating the same, pressure responsive means interposed in the vacuum line between said tubular member and the source of vacuum and cooperable with said lever for swinging the same in one direction in response to a low pressure condition in said line, and a weight carried by said lever and constantly opposing the action of said pressure responsive means to thereby swing said lever in the opposite direction when said low pressure condition does not exist.

10. A bag opening device comprising, a main supporting frame, a spindle mounted on said frame and projecting laterally therefrom for suspending a plurality of bags to be opened by the mouth portions thereof, a tubular member carried by said frame for reciprocable movement longitudinally of said spindle, said tubular member having one end thereof terminating adjacent to the outermost bag suspended from said spindle and the other end connected to a source of vacuum, an oscillatory lever fulcrumed on said frame and having its swinging end cooperable with said tubular member for reciprocating the same, a solenoid cooperable with said lever for swinging the same in one direction, a pressure responsive element interposed in the vacuum line between said tubular member and the source of vacuum and cooperable with said solenoid for energizing the same to swing said lever in said one direction in response to a low pressure condition in said line, and means for swinging said lever in the opposite direction when said low pressure condition does not exist.

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