This invention relates to new and improved apparatus to shake a filled bag to settle the product in the bag and to shape the filled bag. More particularly this invention relates to a new and improved bag conveyor apparatus for receiving a filled bag at one end of a conveyor and as a bag is advanced along the conveyor the shake bag and exert a vibratory force against the bottom and sidewalls of the bag to settle the material in said bag and to shape the bag.

Many products which are filled into bags contain a considerable amount of air, especially when loose product is discharged from a hopper or bucket into a bag. Also when minute particles of product free fall into a container, the particles come to rest in a position, whereby there is a great amount of open space between particles throughout the bag. By shaking the bag, the product settles and thence a given weight of product takes up less volume than originally.

Additionally while shaking the bag to settle the contents of the bag, it is advantageous to properly shape the bag including the bag bottom and sides so that the bag top may be formed easily for entry to the closing device. Further the apparatus for settling and shaping the filled bag shall convey the filled bag away from the bag filling station immediately so that speed in production may be obtained, prevent the bag from tipping, and align the bag so that it is aligned for entry to the closing station, a filled bag delivered to the conveyor from the filling means not always being delivered in an "aligned," straight vertical condition; In order to accomplish the aforementioned results simultaneously and at the same time prevent damaging and scuffing of the sidewalls of a bag, or printing thereon, this invention has been made.

It is an object of this invention to provide new and improved apparatus for settling the material in a filled bag. It is a further object of this invention to provide new and improved apparatus for properly shaping a filled bag to facilitate forming the top of the bag for entry to the closing device and for meeting other handling requirements.

It is still further object of this invention to provide new and improved vibratory V-shaped trough conveyor apparatus for settling and shaping an open top filled bag and properly aligning the bag for entry to a closing device as the bag is advanced along the conveyor.

It is still another object of this invention to provide new and improved mountings for sideboards of vibratory settling and shaping apparatus for preventing scuffing and damaging the side-walls of a bag, or printing thereon, it being understood that the bag is advanced between the sideboards. It is still an additional object of this invention to provide new and improved V-shaped conveyor bag settling and shaping apparatus for supporting and advancing a filled bag between spaced sideboards to facilitate the material in said bag.

A still further object of this invention is to provide a new and improved bag former and shaker that exerts a forming and settling action on a filled bag while said bag is on the bag holder before being released to the conveyor platform of said bag former and shaker. It is still another object of this invention to provide a new and improved base for vibratory bag settling and shaping apparatus.

Other and further objects of the invention are those inherent in the invention herein illustrated, described and claimed and will be apparent as the description proceeds.

To the accomplishment of the foregoing and related ends, this invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the invention may be employed.

The invention is illustrated in the drawings in which corresponding numerals refer to the same parts and in which:

FIGURE 1 is a side elevational view of the bag former and shaker of this invention;

FIGURE 2 is a front end view of the bag former and shaker illustrated in FIGURE 1, the sideboards being shown in full line in position to shape the sidewalls of a filled bag to extend vertically and shown in dotted line to shape the sidewalls of a filled bag to slope inwardly and upwardly;

FIGURE 3 is a perspective view of the apparatus illustrated in FIGURES 1 and 2, said view further illustrating the mounting of the sideboards of said apparatus and showing the sideboards set to shape the bag walls to slope upwardly and inwardly and also set to facilitate positioning a filled bag on the machine and to reduce the thickness of the filled bag as it advances along the conveyor;

FIGURE 4 is an enlarged fragmentary view of the mounting of the eccentric illustrated in FIGURE 1 to show the approximate amount of eccentricity of said eccentric;

FIGURE 5 is an enlarged fragmentary view of a portion of FIGURE 2 to illustrate the mounting of a sideboard on the end of a mounting shaft.

Referring now in particular to FIGURES 1 and 2 there is illustrated a side elevational view and a front view of the bag former and shaker, generally designated 10, of this invention. The aforementioned unit includes a heavy base 11, which may be constructed of a plurality of channel irons connected to form a rectangular frame 12, a top mounting plate 16 secured to said channel irons, and a dense material such as concrete 13 for filling the space enclosed by the mounting plate and the rectangular frame 12. The base is formed with a groove 17 to provide an opening for movement of the eccentric 18 and is secured to the floor 15 by conventional means such as brackets and lag screws 14. By filling the space enclosed by the rectangular frame with a high density material, such as concrete, a heavy base is formed which minimizes the transmission of the vibrations from the unit to the surrounding equipment and thereby provides an exceptionally quiet operating unit and also minimizes vibrations of the unit which decreases the power loss in the unit and thus increases the efficiency of the unit.

A conveyor platform 22 is mounted on the base for limited movement on the base by structure to be set forth hereinafter. The conveyor platform includes a longitudinally extending V-shaped trough 24 having a depending side 25 formed integral with either longitudinal edge of the V-shaped trough. The lower edge of each of the depending sides is bent to form an inturnd flange 26. Secured to each of the opposite longitudinal ends of the trough to supportingly engage the spaced end portions of the trough is a cross plate 27 with end of each of the cross plates being secured to the respective end portions of the inturned flanges 26 by conventional means such as nuts and bolts 28. Also secured to each transverse outer end portion of each of the cross plates in depending relation to the cross plates by the aforementioned nuts and bolts 28 is a bearing 29. The bearings 29 at the back end 24a of the trough respectively journaled for rotation the outer ends of an upper transverse shaft 30, while the bearings 29 at the front end 24b similarly journaled a second upper transverse shaft 30.
Secured by nuts and bolts 32 to the mounting plate in the same spaced relation as the bearings 29 are secured to the conveyor platform four bearings 33. The bearings 33 at the rear end and the base journal for rotation the respective outer ends of the lower transverse shaft 34 while the bearings 33 at the back end of the base similarly journal for rotation a second transverse shaft 34.

Fixedly secured at one end to each of the shafts 34 adjacent each of the bases 33 is a link bar A. The opposite end of each link is fixedly secured at its opposite end to the respective shaft 30 adjacent a bearing 29 that is similarly located on the conveyor platform as the bearing 33 which is adjacent said link. Since the links are of equal length and extend from the respective shafts at the same radial angle and the shafts are mounted in the bearings to extend parallel to one another, the conveyor platform is in level alignment as it is moved through its path of travel relative to the base.

The structure for moving the platform relative to the base includes the motor 58 having a motor shaft 49, said motor secured to the base by conventional means such as nuts and bolts 39. The motor shaft is drivenly connected to the eccentric mounting shaft 41 by conventional drive means 42 such as a belt and pulleys, the eccentric mounting shaft 41 extending parallel to shafts 30, 34 and being journaled for rotation in speed reducer 43 that is secured to the base by nuts and bolts 44.

The aforementioned eccentric 18 which has a radially extending offset 45 is mounted on the mounting shaft 41 in position to, in part, extend downwardly into a grooved portion 17 of the base. One end of the rod 46 is threaded into an appropriate aperture 48 in the shaft 45 in the same manner that sideboard 61 is mounted, said sideboard being of the same size and shape, and located directly opposite another and intermediate the uprights 55, 59. By providing the set screws 68, the mounting shafts are transversely adjustable for accommodating bags of different sizes; while by providing the rubber mounts, each of the mounting shafts can be adjusted separately so the sideboards can be set parallel to each other and to a vertical plane perpendicular to the longitudinal axis as illustrated in solid line in FIGURE 1, inclined upwardly and inwardly toward one another as illustrated in dotted lines in FIGURE 1, or as illustrated in FIGURE 3, the sideboards are set to slope upwardly and inwardly from the V-shaped trough and to slope inwardly toward one another from the back of the unit toward the front end of the unit. Although cylindrical shaped rubber mountings may be used, it has been found that frusto-conical shaped rubber mounts stand up better and also that it is easier to adjust the sideboards to the desired angle if the frusto-conical rubber mountings are used. Further, the aforementioned bearing mounting provides a greater give while still maintaining strength. The purpose of providing the aforementioned adjustable features of the sideboards will become more apparent hereinafter.

As previously mentioned the size and shape of each of the sideboards 61, 62 is substantially the same. Also the sideboards are mounted on the respective mounting shafts to have the lower edge portions 61C, 62C located adjacent the longitudinal edges of the V-shaped trough and located on opposite sides of the trough 24 directly opposite one another. By properly setting the respective mounting shafts, a bag positioned on the conveyor platform in a properly aligned condition will have corresponding portions of each of the side walls of the bag.

The structure of the invention having been set forth, the operation of the bag shaping and settling conveyor of the invention will now be briefly described.

In using the conveyor unit, a filled bag 75 is set on the back end 24c of the conveyor platform 22 by suitable apparatus, as for example the automatic bag machine described in our copending application, Serial Number 806,555, filed April 16, 1959, or by hand; and is advanced in the direction of the arrow 76 toward the front end of the conveyor as a result of the movement of the conveyor platform. The vibratory movement results from driving the shaft 41 which in turn drives the eccentric. The amount of travel X of the eccentric can be any specified amount to obtain the results desired. The movement of the eccentric in turn is transmitted through rod 46 to the conveyor platform to cause the platform to move up and forwardly and then to move downwardly and rearwardly. By setting the positions of links 35 relative to the horizontal as illustrated in the drawings, the upward and forward motion will be relatively slow compared to the downward and rearward movement. However, by adjusting rod 46, the aforementioned relative rates of motion may be changed as will be set forth. The parallel links 35 maintain a level alignment of the conveyor platform in all positions and are mounted at a definite angle so that the up and forward motion of the platform will be a direct result of the motion of the eccentric and rod 46.

By loosening the nut 47, the rod can be adjustably threaded in the offset 45 to change the effective length of the rod and thereby the angle of the parallel links. Shortening of the rod will place the parallel links at a smaller angle with the horizontal and the platform will move more up motion than forward motion. Lengthening the effective length of rod 46 will place the links at a greater angle with the horizontal and thus give the con-
veyor platform more forward motion than up motion. Providing the platform with more up motion than forward motion will result in the bags moving in the direction of arrow 76 at a slower rate than if the conveyor platform was given more forward motion than up motion. Normally a bag is set on the platform to extend between the sideboards to prevent tipping of the bag. By spacing the sideboards so that they are located a slight distance from but within close proximity of a bag that is properly aligned on a conveyor platform, the bag in being "jogged" by the conveyor platform will strike the sideboards which will pack the material in the bag and also will start the sideboards vibrating (due to the resilient mounting only which will create a "spanking action") on a bag that additionally aids in shaping and settling the material in the bag.

The rubber mounts in addition to causing the sideboards to vibrate also prevents the filled bags from being jogged against the sideboards from being scuffed such as occurs when the sideboards are stationary mounted. That is, placing the rubber mounts between the sideboard and the mounting then the sideboards has a certain flexibility, or "give" which prevents scuffing in addition to aiding in settling the material in the bag.

By setting the sideboards for the characteristics of the material in a filled bag, the bags are properly shaped as the bags are advanced along the conveyor platform. For example if the material in the bag is relatively fine and flows easily so that the center portion of the bag extends or bulges outwardly a greater distance than desired, the sideboards may be set as such illustrated in FIGURE 3. By spacing the back side portion 61a, 62a of the sideboards further apart than forward end portions 61b, 62b, the bag in being advanced along the conveyor platform will be shaped to have a narrower thickness T at the forward end of the platform than it had at the back end of the platform. By positioning the sideboards to have the top end portions 61d, 62d more closely adjacent than the bottom end portion 61c, 62c, the top end of the bag will be shaped to assume a narrower thickness than the bottom end of the bag. The shaping of the bag to have a narrower top thickness than bottom thickness compensates for the flow characteristics of the material in the bag while shaping the bag to an overall narrower thickness dimension will "flatten the bulge." Even if the bag does not have the above mentioned physical characteristics, it is desirable to flatten any "bulge" in the center portion of the filled bags. Shaping the bag in the aforementioned manner facilitates closing the top of said bag so that it will be in proper condition to be formed for entry to the closing unit (not shown). From the foregoing description it becomes apparent that the sideboards may be set to shape the bags as necessary to facilitate further handling of the bags performing further operations on the bag, and storing the bags.

The V-shaped conveyor platform aids in keeping the bags from tipping since the trough walls 24c are inclined upwardly to support opposite side wall portion 75c of the bag. Also the V-shaped platform properly aligns the bags for entry to the closing units (not shown). For example if a filled bag is positioned on the back end of the conveyor platform so that the central line 75a is at a slight angle and offset from the trough apexed portion 25f as indicated by the line 80, the V-shaped conveyor trough will straighten out the misaligned bag as the bag advances on the conveyor platform so that the central line 75c of the bag will be aligned with the direction of the motion of the conveyor. Also as the conveyor platform is jogged upwardly and forwardly the center line portion 75a of the bag will "settle" into the apexed portion 25d of the trough to be aligned therewith as illustrated in FIGURE 2. Aligning the center line of the bag with the direction of motion of the conveyor in the spaxed portion thereof is very desirable since if the bag is not properly aligned difficulties are encountered in bag top forming and entry to the closing unit.

The V-shaped conveyor platform also assists in shaping the bags. For example when a filled bag is delivered to a flat surface conveyor, the bag bottom tends to flatten the bag before loading. FIGURE 1 shows a horizontal plane (bulged) instead of being elliptical in shape. As a result of the bag wall being rounded, difficulty is encountered when forming the bag top for entry to the closing unit. That is, since the bag walls are rounded, the top corner portion of the bag curves in a downward direction and thus a larger force has to be exerted to properly form the top of a bag and more handling of the bag is required in order to properly position the top of the bag so that the top may be formed for entry to the closing unit. With a V-shaped conveyor, the bag walls tend to remain elliptically shaped or assume an elliptical shape and thus overcome the aforementioned problems.

Usually when the conveyor unit of this invention is being used, one bag is located adjacent to the forward end of the unit when the next bag is positioned on the rearward end. Even if the bag has been removed from the forward end of the conveyor platform, the time another bag is placed on the platform, the board usually vibrates for short intervals after the removal of the first bag.

When the bag former and shaker is used in conjunction with apparatus such as the machine described in our copending application, Serial Number 806,855 the "residual" vibration of the sideboards will exert a forming and settling action on a filled bag while it is still on the bag holder. That is, the bag holder will move a filled bag to a position at least partially between the sideboards and since the sideboards continue to vibrate for a short time even after there is no bag on the conveyor platform, the sideboards will exert a forming and settling force on the bag held by the bag holder even before the bag is released to the conveyor trough.

The combination of the V-shaped conveyor platform and the flexible sideboard action described heretofore results in keeping the bag from tipping, settling the product in the bag, giving the bag proper shape, and making the bag top easier to form for entry to the closing unit.

As many widely apparent different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that we do not limit ourselves to the specific embodiments herein.

What we claim is:
1. Apparatus for simultaneously conveying and shaping a bag comprising a frame, an elongated conveyor platform, means mounting said conveyor platform for vibratory movement to advance a bag along said platform, a pair of sideboards, and means for transversely mounting one sideboard on either side of the conveyor platform to extend to an elevation substantially above the conveyor platform to abut against the respective side of a bag as it is advanced, said side board mounting means including two mounted uprights, one on either transverse side of the conveyor platform, three elongated transversely extending shafts secured to each upright to extend horizontally inwardly toward the conveyor platform and in spaced relation to have the elongated axes of said shafts located at the apices of a triangle, a resilient mount secured to the inner end of each shaft, means for securing each mount to a sideboard with each resilient mount between the shaft and sideboard to permit limited movement of the sideboard relative to the shaft, said shafts and resilient mounts holding the respective sideboard adjacent to the conveyor platform to strikingly engage an advancing bag.
2. The apparatus of claim 1 further characterized in that each shaft is secured to an upright by means for adjusting a transversely adjusted position relative to the upright whereby upon adjustably positioning one shaft the plane of each sideboard may be varied vertically and horizontally relative to the other sideboard.

3. Apparatus for simultaneously conveying and shaping a bag, comprising a frame, a longitudinally extending conveyor platform having an elongated V-shaped trough, rotatably translating and supporting means mounted on said frame and attached to said conveyor platform for moving said conveyor platform to advance a bag in a longitudinally forward direction along said V-shaped trough, a pair of side boards, and means mounting one side board on either transverse side of the conveyor platform to extend to an elevation substantially above the conveyor platform for vibratory abutting against the respective side of a bag as it is advanced along the V-shaped trough, the last mentioned means including an upright mounted on the frame on each transverse side of the trough, at least one mounting shaft for each upright, means for securing each shaft to the respective upright to extend transversely inwardly toward the trough and resilient mounting means for each shaft for vibratory securing a side board to the respective shaft.

4. The apparatus of claim 3 further characterized in that each resilient mounting means includes a rubber mount, means for securing the mount to the inner edge of the respective shaft and means for securing the respective side board to the mount with the mount located between the respective shaft and said respective side board whereby the side boards are vibratory connected to the respective shafts.

5. Apparatus for conveying and shaping a filled flexible container comprising a frame, longitudinally extending means mounted on the frame for longitudinally forward direction, a side board for each transverse side of the conveyor means, a single upright on either transverse side of the conveyor means mounted on the frame in longitudinally offset relationship, transversely extending spaced shafts mounted on each upright, and resilient means for each shaft for vibratory connecting the respective shaft to the adjacent sideboard, the resilient means and shafts connected to each upright to vibratory support a side board in position to strikingly engage the container as it is advanced by the conveyor means.

6. Apparatus for conveying and shaping a filled bag comprising a frame, longitudinally extending means mounted on the frame for vibratory conveying a bag in a longitudinally forward direction, an upright mounted on either transverse side of said conveying means, a pair of side boards, at least one shaft mounted on each upright to extend in a transverse direction, and resilient means mounted on each shaft for vibratory attaching a side board to the respective shaft in a position to struckly engage the side wall of a filled bag as it is advanced by said conveyor means, each of said resilient means including a resilient member located transversely between a shaft and the adjacent side board.

7. Apparatus for conveying and shaping a filled bag comprising a frame, longitudinally extending means mounted on the frame for vibratory conveying a bag in a longitudinally forward direction, an upright mounted on the frame on each transverse side of said conveying means, a plurality of horizontal transversely extending shafts mounted on each upright in spaced relation, a frusto conical resilient mount mounted on each shaft, a pair of side boards, one side board being mounted on either transverse side of each resilient means, each of said resilient means mounted on the respective transverse side of the conveying frame, a pair of upright means mounted on either transverse side of said resilient means, means for strikingly engaging the adjacent bag sidewise as the bag is advanced by said conveyor means.

8. Apparatus for shaping a filled flexible container having sidewalls comprising a frame; longitudinally extending means mounted on said frame for movably supporting said container; means on each transverse side of the support means for strikingly engaging opposite sidewalls of said container to shape said sidewalls as said container is moved therebetween; and means mounted on the frame for resiliently mounting the strikingly engaging means to extend on either side of the container positioned on said support means, said resilient mounting means including an upright mounted adjacent and on each transverse side of said support means; a transversely horizontally extending shaft having an inner end mounted on each upright; and for each shaft, means for vibratory attaching the adjacent side of the conveyor means and attached to the respective shaft, each attaching means including a resilient mount between strikingly engaging means and the inner end of the respective shaft.

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