April 22, 1958 J. E. M. MORTON 2,831,591

BULK PACKAGE OPENER

Filed Dec. 6, 1956 3 Sheets-Sheet 1

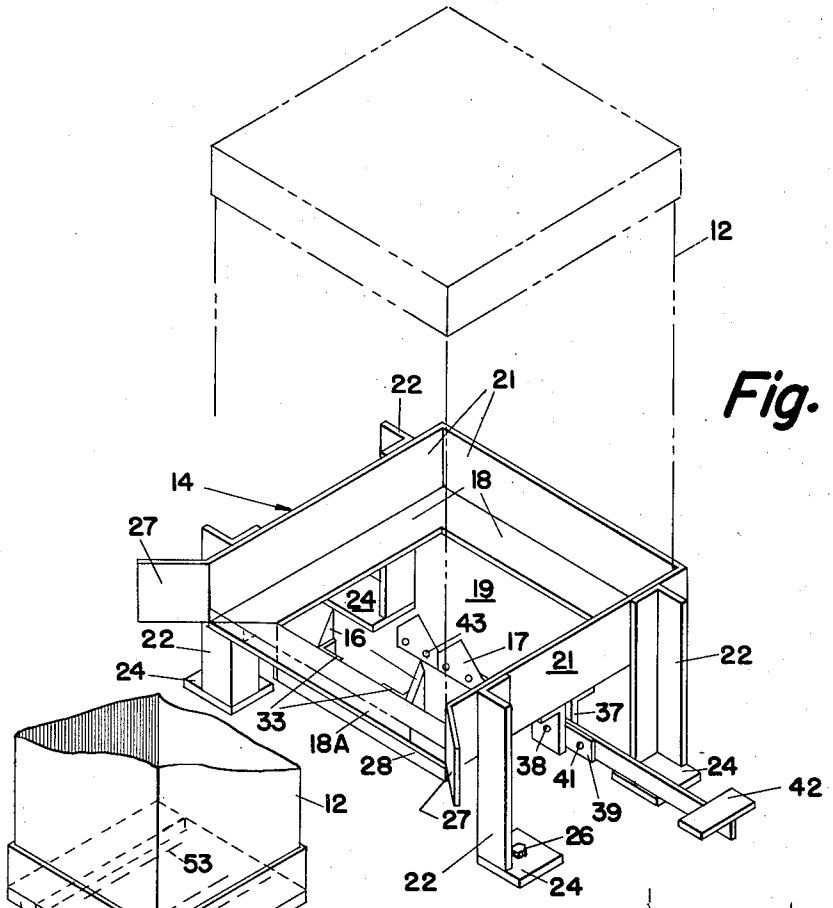


Fig. 1

Fig. 2A

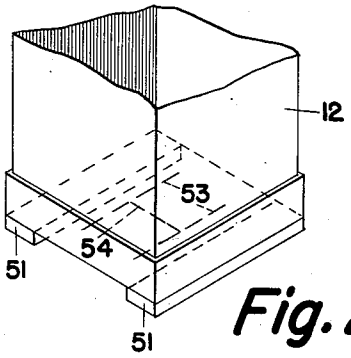


Fig. 2B

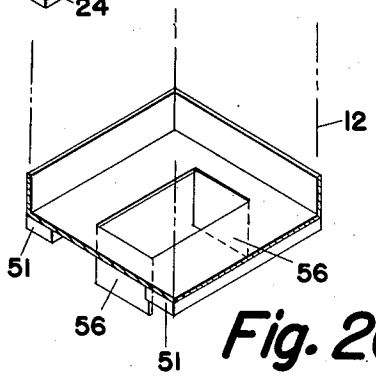


Fig. 2C

INVENTOR.
JAMES E. M. MORTON

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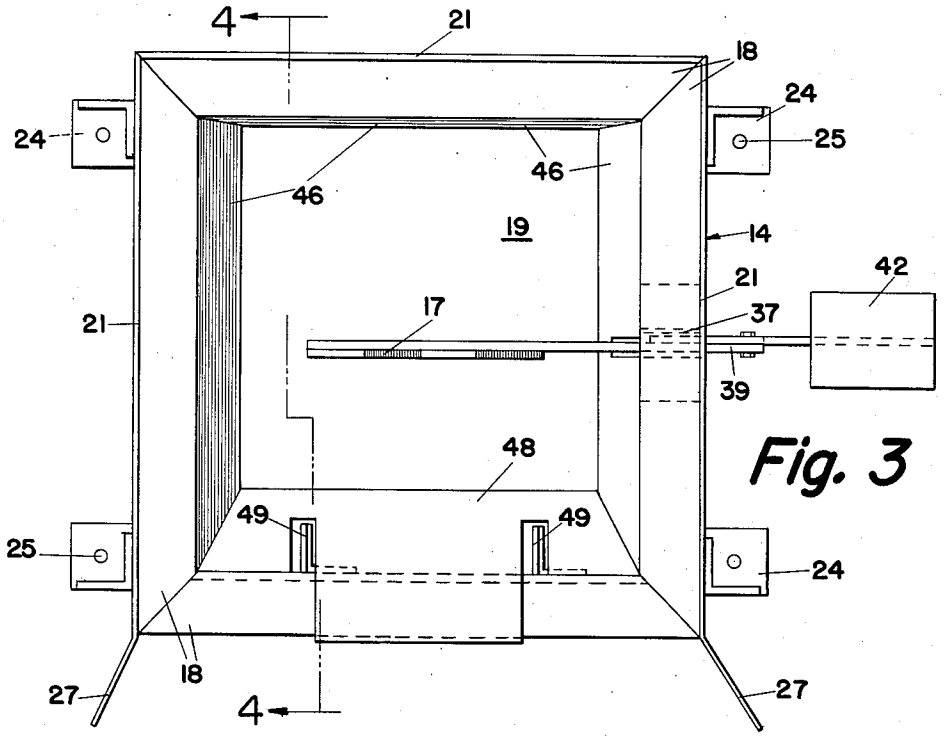


Fig. 3

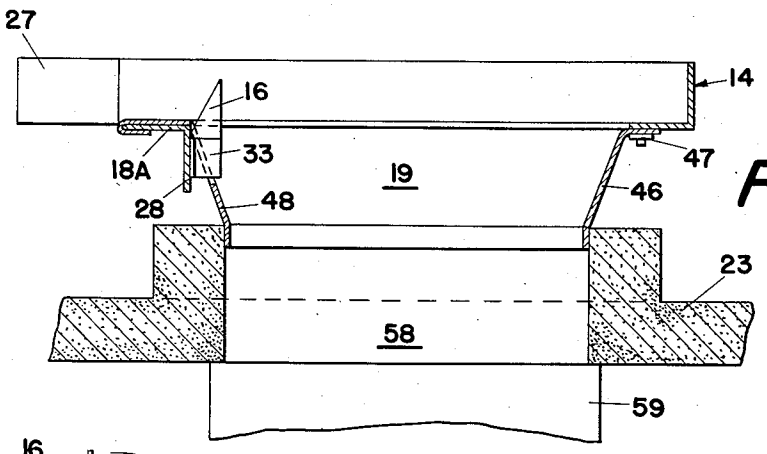


Fig. 4

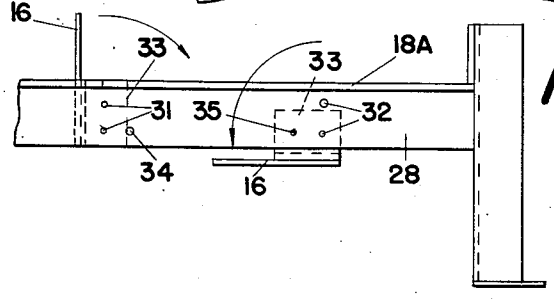


Fig. 5

INVENTOR.
JAMES E. M. MORTON

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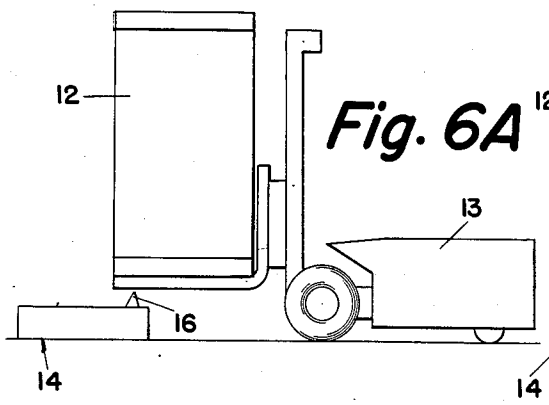


Fig. 6A

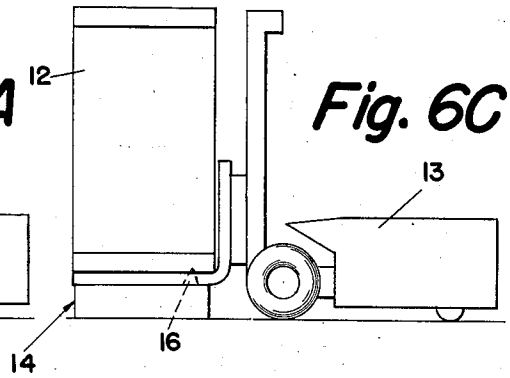


Fig. 6C

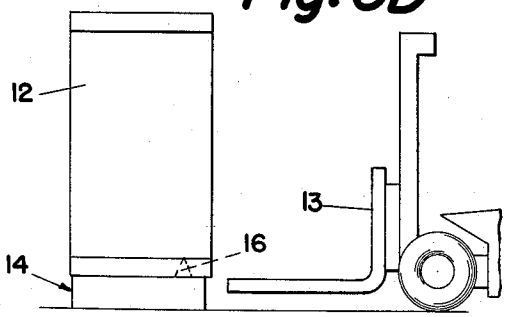


Fig. 6D

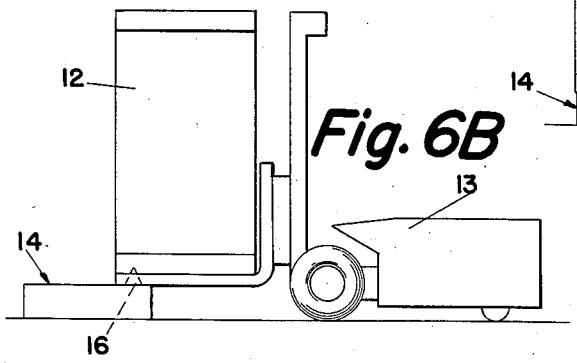


Fig. 6B

INVENTOR.
JAMES E. M. MORTON

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2,831,591

BULK PACKAGE OPENER

James E. M. Morton, Jenkintown, Pa., assignor to Rohm & Haas Company, Philadelphia, Pa., a corporation of Delaware

Application December 6, 1956, Serial No. 626,720

8 Claims. (Cl. 214—305)

Broadly stated, the object of the present invention is to provide a rapid-operating and relatively easy means for opening and emptying bulk packages which are so large and weigh so many hundreds of pounds that they require the use of a device such as a motorized "fork-lift" to move them about.

A more specific object is to provide a means for rapidly and readily opening heavy cardboard containers which are on the order of five (5) feet high and three (3) feet square, and whose contents have a net weight on the order of 2000 pounds.

Another object is to provide a device for opening large bulk packages containing powdered substances for delivery to a chute or other receptacle without permitting the powder to escape into the air and cause objectionable fumes.

Still another object is to provide a device for emptying large bulk packages without having to turn them over in order to dump out their contents.

In practicing my invention I attain these and other objects by means of an apparatus which essentially is composed of the following parts: a container-supporting frame which is adapted to fit over a chute or receptacle and has side and bottom rails for guiding the container into proper position thereon, one or more knives mounted in a stationary position at the front entrance of the frame so that as the container is slid rearwardly into position on the frame the bottom surface of the container is cut along at least one line from front to back, and one or more lever-operated knives mounted for pivotal movement from below the container up through its bottom surface on a line which is substantially at right angles to the cuts made by the fixed knives. The lever-operated knives (only one is illustrated in the drawings) are actuated by the operator who need only apply slight pressure with his foot on the portion which protrudes from the frame. One form of my invention which has already proven highly successful in commercial production applications is illustrated in the attached drawings, wherein:

Fig. 1 is a view in perspective of the container-supporting frame bolted to the floor (in position over a chute, as shown in Fig. 4, which leads to a kettle on the floor below), the bulk package or container being shown in phantom lines to be resting thereon;

Figs. 2A—2B—2C are progressive views showing the lower end of the Fig. 1 container, first with a pair of parallel slits in the container bottom, then with a slit made transversely with respect to the other two which are "connected" thereby, and finally with the cut portions opening in trap-door fashion to permit the container's contents to exit therefrom;

Fig. 3 is a top plan view of the container-supporting frame of Fig. 1, but additionally showing an apron-like arrangement depending inwardly from the frame, the four sections which make up the apron fitting together to form a funnel or chute;

Fig. 4 is a cross-sectional view taken along line 4—4 of Fig. 3, showing the way in which the apron or chute

leads into an opening in the floor, below which is a kettle (not shown) which is to receive the contents of the container that is being emptied;

Fig. 5 shows a portion of the front of the Fig. 1 frame, one of the parallel knives being shown in an alternate position in which it can be secured as a personnel safety measure when the apparatus is not in use; and

Figs. 6A—6B—6C—6D are progressive views showing the manner in which exceptionally heavy and bulky packages are delivered by a "fork-lift" vehicle to my novel apparatus, and at the same time giving the bottom of the container the pair of parallel slits shown in Fig. 2A.

THE PROBLEM

In many industrial operations it is necessary to transfer many hundreds or thousands of pounds of materials from the containers in which they are marketed to the receptacles in which they are to be used. In the past, it has been the practice to ship powdered materials in 50 pound paper bags. The handling of these bags, particularly where large numbers of them are required for a given operation, is a time-consuming process, and in the act of opening and emptying them there has always been an attendant waste of material and the formation of powder fumes which were obnoxious and irritating. For example, in the manufacture of a polyester resin, it has been the practice to load a kettle, which consumed 24,000 pounds at each filling, with adipic acid. As this material normally has been marketed in 50 pound paper bags, this meant that 480 such bags had to be separately opened and poured through a hopper and chute to fill the kettle. This operation normally would take about two to two-and-a-half hours. Obviously, much of the material was wasted by not being entirely emptied from each bag and at the same time spilling or powdering into the atmosphere to make working conditions uncomfortable, to say the least.

A recent development in the packaging art has successfully overcome many of the objections found with the practice described above. According to this new development, the powdered chemicals are now packaged in a heavy cardboard, rectangular container **12**, which is approximately five feet long and three feet square in cross section. This container holds 2000 pounds of material such as adipic acid. Container **12** (Figs. 1, 2 and 6) is designed to be moved about by means of a conventional "fork-lift" **13** (Fig. 6). By using such a container, its designers intended to save the consumer a considerable amount of handling time, since only one package need be opened and emptied instead of 40 bags of 50 pounds each. Their recommended means for handling and emptying the new type container was to have a modification made to fork-lift **13**, comprising a means (not shown) for grappling the container and turning it approximately 180° in order to empty the contents through the top. Althought this obviously would work and would accomplish the desirable objective of saving a considerable amount of handling time, it was objectionable for at least two reason: one, the modification to the fork-lift was estimated by a manufacturer of such vehicles to cost many thousands of dollars per machine; and, two, the emptying of a powdered material such as adipic acid in that manner would cause powder-fuming conditions which would be much worse than those obtained when the small bags were emptied.

In view of the objectionable features just mentioned, therefore, the problem was to devise a means for opening such large and heavy packages as container **12**, quickly and easily, and make possible the emptying of the container's contents into any receptacle, such as the kettle mentioned above, in a manner which would prevent the formation of powder fumes or at least substantially pre-

vent their escape into the atmosphere outside of the container and the kettle.

THE SOLUTION

I have devised an apparatus which is simple and relatively inexpensive to make, is easy to operate, and which has readily solved the problem described above. This apparatus, as will be better understood from the description which follows, preferably causes a pair of parallel slits to be made through the bottom of container **12** in the very act of delivering the container to a supporting frame therefor. The operator then need only apply pressure with his foot to a pedal-operated knife which cuts a slit in the container bottom, but this one substantially at right angles to the other two and intersecting them so that the cut portions give way to the weight of the contents and open like a trap-door to permit rapid emptying of the contents.

Construction of invention

A preferred embodiment of the novel apparatus of the present invention is shown in the accompanying drawings. Essentially, it consists of rectangular container-supporting frame **14**, a pair of parallel, fixed knives **16**, and a pivotable, pedal-operated knife **17**. Frame **14** has a flat, horizontal, perimetrical shelf portion **18** for supporting container **12**, said shelf portion **18** enclosing an opening **19** through which the contents of the container will be emptied into the receptacle below. The horizontal shelf portion **18** preferably is dimensioned to accommodate either end of container **12** so as to center the container's bottom surface over opening **19**. Rising vertically from the outer edge of the frame's horizontal shelf portion **18**, at the rear and at the left and right sides of the frame, are retaining wall portions **21** which serve to hold container **12** in its "centered" position on frame **14**.

At each of the four corners of the frame there is a leg **22** which supports the frame in spaced relationship from the floor **23**. Openings **25** (Fig. 3) are provided through the flat base portion **24** of the legs for accommodating bolts **26** (Fig. 1) used to anchor the apparatus to the floor.

The front of frame **14** has no retaining wall as it is intended for the containers being delivered to the frame to be lowered upon the forward part **18***a* of the flat horizontal shelf portion **18** on which the container ultimately will rest. However, there are provided, at the left and right extremities of this entrance into the frame, divergent extensions **27** of retaining walls **21** (see Figs. 1, 3, and 4) which aid in guiding the container into its proper position on the frame.

The forward part **18***a* of the frame's container-support shelf portion **18** will be seen to have a depending member **28** which forms a skirt across the front of the frame (Figs. 1, 4, and 5). A pair of holes **31** and another pair of holes **32**, in spaced relationship from each other as shown in Fig. 5, extend through the wall thickness of member **28**. These holes are aligned with similar holes in the flanged portion **33** of knives **16** so that bolts can be passed through the mating holes to secure the knives to the frame's depending member **28**. Another hole **34** through member **28** is provided at right angles to a line which passes through both holes **31**; and a hole **35** similarly is provided at right angles to a line which would connect holes **32**. Holes **34** and **35** are respectively spaced from holes **31** and **32** so that, when knives **16** are detached and turned down from the vertical to the horizontal position shown in Fig. 5, they may be secured in that position in order to keep the knives from projecting upwards from the frame when not in actual use.

Attached at one side to the bottom of the horizontal, perimetrical frame portion **18**, is a depending bracket **37**. This bracket may conveniently take the form shown in Figs. 1 and 3 which consist of two L-shaped members, the lower arms of which have aligned openings therethrough for supporting a pivot pin **38**. Extending between and through the parallel, L-shaped members of bracket **37**, and pivotably mounted with respect thereto on pin **38**, is a shaft **39** of the pedal-operated knife **17**. This shaft may be of a single-piece construction, or if preferred for simplifying the construction and assembly it can be a multiple unit (as shown in Fig. 1) conveniently joined together by means of a bolt **41**. At the end opposite knife **17**, the shaft is provided with a pedal **42**. The knife **17** may be made with two, axially aligned blades (as illustrated) secured to shaft **39** by means of bolts **43**, although a single blade or even more than two blades could be made to work satisfactorily, and of course the blades can be secured to the shaft by other means.

From the construction which has thus far been described, it will be apparent that the frame can be specially dimensioned so that it will fit rather snugly atop a receiving receptacle and the contents of the container will be able to fall through frame opening **19** directly into the receptacle without permitting the contents to escape between the frame and the receiving receptacle. However, in order to make the apparatus capable of more universal application, and not require an individual frame to be made for each differently sized receptacle, an apron-like arrangement has been provided which functions as an adaptor to make the larger sized frames usable with receptacles having smaller openings, and at the same time acts as a funnel or chute so as to direct the contents of the container into the receiving receptacle in a manner that essentially prevents the contents from escaping into the atmosphere from the space between the two. This apron (which has been omitted from the Fig. 1 illustration in order to expose the knives and other parts more clearly) is shown in Figs. 3 and 4. Its construction will now be described in some detail.

The apron may be considered to comprise a fixed and a removable portion. The fixed portion consists of three parts **46** which are secured to the under-side of the frame's horizontal, perimetrical shelf portion **18**, as by means of bolts **47**. The fixed parts **46** of the apron will be seen from Figs. 3 and 4 to be directed inwardly and downwardly from the frame's perimetrical shelf portion **18** so as thereby to reduce the area of opening **19** at the exit or lower end of the funnel formed by members **46** (see Fig. 4). The fixed apron parts **46** can be arranged to overlap one another at the corners where they meet or be secured to each other, as by welding (not shown). If not permanently joined, these parts can be bent towards or away from each other so as to increase or diminish the size of the opening which they form, as may become necessary.

The fourth side, which is the front or forward portion of the frame on which the fixed knives **16** are mounted, is provided with the removable part **48** of the apron. This part is shaped as shown in Fig. 4 so that its upper end can be conveniently hooked on to the forward edge of member **18***a* and be supported thereby. The removable apron part **48** is provided with slots **49** which make it possible to slip the part over fixed knives **16** (when they are in the vertical position shown in Figs. 1 and 4) into position. When it is in its operable position, it co-acts with the adjoining fixed apron parts **46** (see Fig. 3) to complete the funnel or chute-like arrangement (as shown in Fig. 4). The removable part also can be flexed or bent, as desired, to adapt it to different sizes of receiving receptacles.

Operation of invention

The operation of my invention is as follows. The container **12** is picked up by the fork-lift **13** and brought to my novel apparatus as shown in Fig. 6A. The end of the container which is nearest to the inventive apparatus is gradually lowered on to the forward part **18***a* and then is shoved rearwardly, until it abuts the rearmost retaining wall (and between the opposing side retaining walls) **21**.

This rearward position of the container is progressively shown in Figs. 6B, 6C, and 6D. The bottom of container 12 is equipped with wooden slats 51 (see Figs. 2A, 2B, and 2C), one on each side, to make it convenient for the forks of fork-lift vehicle 13 to get under and raise the carton in accordance with conventional practice. Sometimes, the containers are supplied with one or more additional slats; if so, these should be stripped off the bottom of the container (which is simple to do as they are easily fastened by some glue or other adhesive) in order to bare an adequate area of the cardboard surface which is to be cut.

As container 12 is lowered on to part 18*a* of the frame, the bottom of the carton will become pierced by the points of fixed knives 16. Then, as the carton is moved back into position on the frame, parallel slits 53 (see Figs. 2A and 2B) are made through the container bottom almost across its entire depth from front to rear. The container is then in the position shown by Figs. 1, 6C, and 6D. Next, the operator removes the container top in order to vent the package to the atmosphere. Generally, the container top (and bottom) is secured to the body of the package by a steel band (not shown). The operator snips the band with a tin shears, or the like, and is then able to lift off the lid very easily. The operator then applies pressure with his foot on pedal 42, causing shaft 39 to pivot on pin 38 and raise the movable knife upwards until it pierces the bottom of the container. The cut 54 made by knife 17 is substantially at right angles and between parallel slits 53 which it thereby intersects as shown in Fig. 2B.

As soon as slits 53—54 are made, the cut portions 56 of the container bottom give way under the great pressure of the container's contents, much like a trap door as shown in Fig. 2C. The contents of the container rapidly empty through the large opening in its bottom and, if the apparatus is situated over an opening 58 in the floor as is represented in Fig. 4, the contents can be delivered directly therethrough and through a connecting feed-pipe 59 to a connecting receptacle, such as a kettle (not shown) for manufacturing resins.

SUMMARY

From the foregoing it will be seen that I have provided a rapid-operating and relatively easy means for opening and emptying bulk packages which are so large and weigh so many hundreds of pounds that they require the use of a device such as a motorized fork-lift to move them about; that I have provided a means for rapidly and readily opening heavy cardboard cartons which are on the order of five feet high and three feet square, and whose contents have a net weight on the order of 2000 pounds; that I have provided a device for opening large bulk packages containing powdered substances for delivery to a chute or other receptacle without permitting the powder to escape into the air and cause objectionable fumes; and that I have provided a device for emptying large bulk packages without having to turn them over in order to dump out their contents.

It will be apparent to persons skilled in the art that the invention which I have herein disclosed is capable of considerable modification within its spirit and scope, and need not necessarily be limited to the specific form herein shown and described by way of illustration. Some of the alternative constructions and means for operating the apparatus have been disclosed throughout the preceding description. As examples of some other changes which may be employed by those practicing this invention, the following suggestions are made.

The parallel, fixed knives 16 may be replaced by a single knife or a battery of knives such as three, four, or more. The pedal-operated knife 17 can just as conveniently be mounted on the opposite side of the apparatus from that which has been illustrated. In fact, the pedal-operated knife could just as suitably be mounted for pivotable movement from the back end of the frame, with the knife 17 secured to shaft 39 substantially at right angles thereto rather than in co-axial alignment therewith, as shown. Knife 17 need not even be adapted so that it makes its cut 54 at a right angle to the slit(s) 53 made by fixed knives 16, the only requirement is that cut 54 intersect slit(s) 53 so as to make possible the rapid formation of a sizable opening in the bottom of the container. As another possible modification, knife 17, which has been described as substantially a single knife, with one or more teeth (two such teeth or blades are shown in Fig. 1), might also be made as a battery of parallel knives so that when the operator steps on pedal 42 he will effect a number of transverse slits to intersect those made by fixed knives 16.

Still another obvious extension of the present invention would be to use it in opening bulk packages or containers which do not have the particular rectangular shape which has been illustrated. For example, the older type cylindrical drums can also be advantageously opened by the present invention. The only major modification that would be required would be to make frame 14 circular instead of rectangular. In that case, the circular equivalent of the retaining walls 21 shown in the rectangular supporting frame need be interrupted a sufficient length to permit the admission of the container. In fact, both the rectangular and the circular forms of the container-supporting frame need not even be supplied with retaining walls, although it must be obvious that it is easier to practice the invention with their aid than without them. Similarly, the invention can be adapted for use with hexagonal or other polygonal-shaped containers.

As another suggestion for modification, the frame conceivably could be made without legs 22. In this case, instead of having bracket 37 below the frame an opening would be made through one of the retaining walls and shaft 39 could be adapted to extend therethrough. Such a frame without legs could be used to rest directly on top of a receiving receptacle, an opening in the floor, or the like, rather than in the spaced relationship indicated in the drawings.

It should be quite apparent, from the various alternative embodiments which have just been described, that the present invention is capable of many different designs, all within the scope of the invention. Accordingly, I do not wish to be bound by any specific form herein disclosed, but only by the metes and bounds of the claims set forth below.

I claim:

1. A bulk package opening and emptying apparatus comprising: a frame having a shelf portion extending therefrom for supporting the package above the site to which the contents of the package are to be delivered and having a front portion over which the package is passed when it is slid backwardly into position on said frame; a first knife removably attached to the front portion of said frame and projecting upwards therefrom into the path of the package a height which is sufficient to pierce the bottom of the package when it is resting on the shelf portion of said frame, thereby enabling that bottom to be slit a substantial distance across its surface as the package is slid across said first knife onto the shelf portion of said frame; and a second knife pivotably mounted with respect to said frame so as to be movable from below up into the bottom of said package after it is in position on said frame, said second knife being adapted to effect a cut in said package bottom which intersects the slit made by first knife; whereby an opening into the bottom of said package can be made through which the contents thereof can be emptied by force of gravity.

2. The apparatus of claim 1 additionally comprising an apron portion which is secured to the frame and pro-

jects downward and inward towards the center of the frame to act as a chute for funneling the contents of the container towards the site to which they are to be delivered.

3. An apparatus for opening and emptying essentially rectangular containers of large bulk and weight, comprising: a substantially rectangular frame for supporting the container above the site to which the container's contents are to be delivered, said frame having a perimetrical surface on which the container will rest, a rear retaining wall and a pair of opposed side retaining walls rising substantially vertically from the outer edges of the frame's perimetrical surface to guide the container into proper position thereon and to retain it there; a first knife removably attached to the front of said frame and projecting upwardly therefrom into the path of the container a height which is sufficient to pierce the bottom of the container when it is resting on the perimetrical surface of said frame, thereby enabling that bottom to be slit a substantial distance across its surface as the container is slid rearwardly across said first knife onto the perimetrical surface of said frame and adjacent to its rear and side walls; and a second knife pivotably mounted on said frame so as to be movable from below up into the bottom of said container after it is in position on said frame, said second knife being adapted to effect a cut in said container bottom which will intersect the slit made by said first knife; whereby an opening into the bottom of said container can be made through which the contents thereof can be emptied by force of gravity.

4. The apparatus of claim 3, additionally comprising: an essentially U-shaped first apron portion attached to the rear and opposed side retaining walls, said first apron portion projecting downward and inward from the frame's perimetrical surface towards the center of the frame with its open end facing the front of the frame; and a removable linear-shaped second apron portion having a slot for enabling the first knife to protrude therethrough, said second apron portion being adapted to rest on the front of said frame and project downward and inward therefrom so as to form, together with said U-shaped first apron portion, a rectangular chute for funneling the contents of the container towards the site to which they are to be delivered.

5. A bulk package opening and emptying apparatus comprising: a frame for supporting the package above the site to which the contents of the package are to be delivered and having a forward portion over which the package is passed when it is slid rearwardly into position on said frame; a plurality of knives in substantially parallel relationship to each other and removably attached to the forward portion of said frame so as to project upwards therefrom into the path of the container a height which is sufficient to pierce the bottom of the package when it is resting on said frame, thereby enabling that bottom to be given a plurality of parallel slits a substantial distance across its surface as the package is slid across said attached knives onto the frame; and a pedal-operated knife pivotably mounted on said frame so as to be movable from below up into the bottom of said package after it is in position on said frame, said pedal-operated knife being adapted to effect a cut in said package bottom which intersects the parallel slits made by said attached knives; whereby an opening into the bottom of said package can be made through which the contents thereof can be emptied by force of gravity.

6. An apparatus for opening and emptying essentially rectangular containers of large bulk and weight, comprising: a substantially rectangular frame for supporting the container above the site to which the container's contents are to be delivered, said frame having a perimetrical surface on which the container will rest, a rear retaining wall and a pair of opposed side retaining walls rising vertically from the outer edges of the frame's perimetrical surface to guide the container into proper position thereon and retain it there; a first set of knives in essentially parallel relationship to each other removably attached to the front of said frame and projecting upwardly therefrom into the path of the container a height which is sufficient to pierce the bottom of the container when it is resting on the perimetrical surface of said frame, thereby enabling that bottom to be given a plurality of parallel slits a substantial distance across its surface as the container is slid across said attached knives onto the frame; and a pedal-operated knife pivotably mounted on said frame so as to be movable from below up into the bottom of said container after it is in position on said frame, said pedal-operated knife being adapted to effect a cut in said container bottom which intersects, substantially at right angles to each other, the parallel slits made by said attached knives; whereby an opening into the bottom of said container can be made through which the contents thereof can be emptied by force of gravity.

7. The apparatus of claim 6 additionally comprising: an essentially U-shaped first apron portion attached to the rear and opposed side retaining walls, said first apron portion projecting downward and inward from the frame's perimetrical surface towards the center of the frame with its open end facing the front of the frame; and a removable linear-shaped second apron portion having multiple parallel slots for enabling the attached knives to protrude therethrough, said second apron portion being adapted to rest on the front of said frame and project downward and inward therefrom so as to form, together with said U-shaped first apron portion, a rectangular chute for funneling the contents of the container towards the site to which they are to be delivered.

8. The apparatus of claim 1 additionally comprising a pair of mutually divergent extensions each secured to the respective extremities of the front portion of said frame in such position as to be in guiding relationship with respect to a package being delivered to and passed over the front portion of the frame in order to help direct the package onto said frame's shelf portion.

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