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DUSTPROOF DRUM CLOSURE AND DISPENSER

Filed Oct. 20, 1964

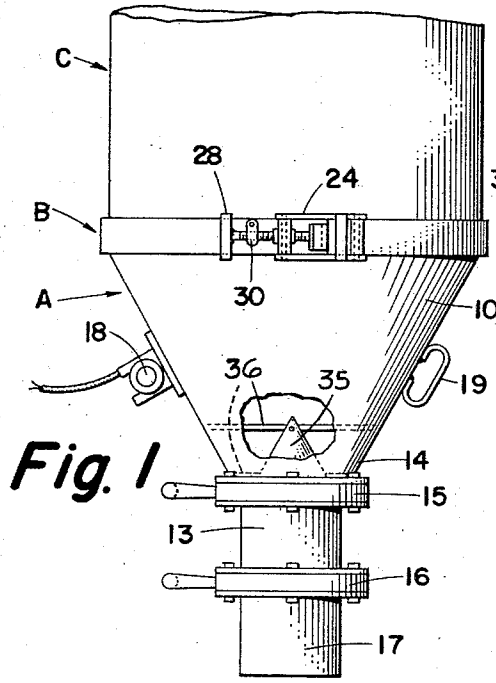


Fig. 1

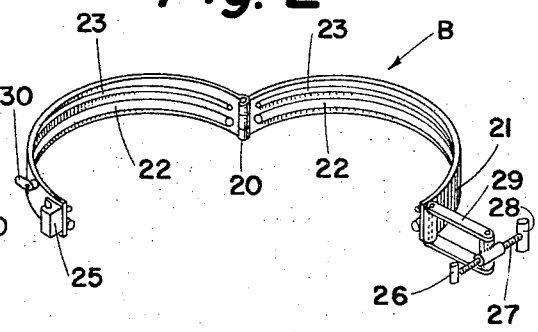


Fig. 2

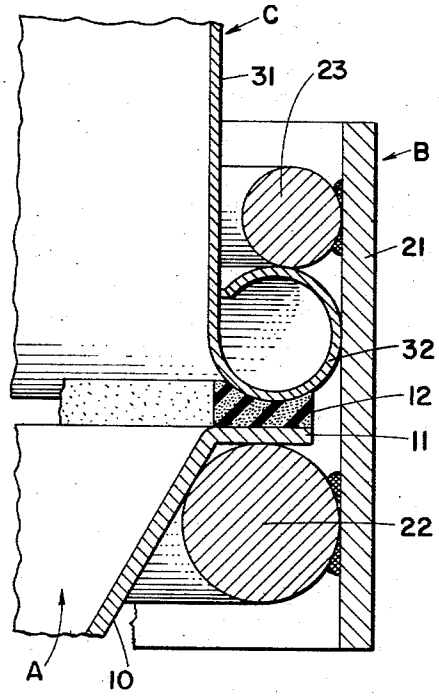


Fig. 3

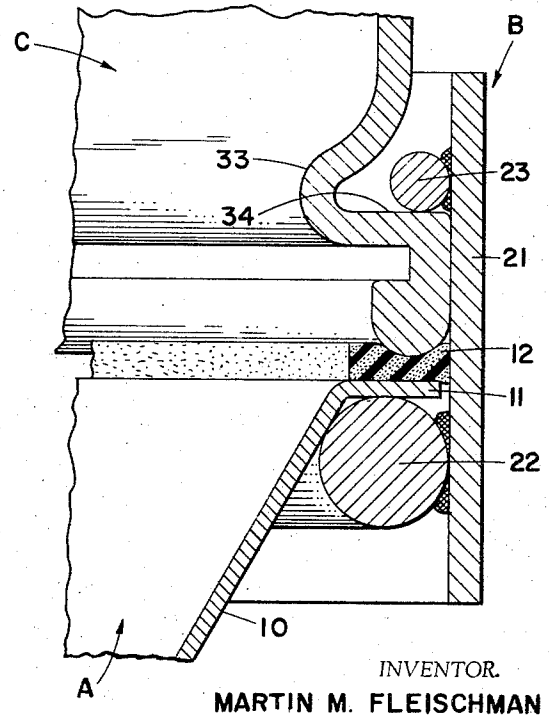


Fig. 4

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DUSTPROOF DRUM CLOSURE AND DISPENSER

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This invention pertains to a combination dustproof closure and dispenser for drums. More particularly, it relates to apparatus which can be mounted on standard size steel and fibre drums so as to both seal them and convert them into bins which allow for incremental dispensing of their contents.

Steel and fibre drums are widely used in industry. They are of particular importance in the shipment of flowable solid materials. When such materials are shipped in drums of this type, the drums most often used have fully removable heads which attach to strengthening flanges provided around the top of the drums. Once the heads are removed, the contents may be dumped, scooped out, or handled in various other manners all involving relatively large amounts of manual labor. Depending on the nature of the contents, it is not unusual for such drums to contain between about 100 and 500 pounds of material.

Accordingly, it is an object of this invention to provide a device which can serve as a closure for an open drum utilizing, as a means for attachment to said drum, the flanged structure of the drum which cooperated with the original closure.

A further object of the invention is to provide a device which constitutes a dustproof closure and dispenser for the contents of the drum.

Still another object of the invention is to provide a device which allows fixed increments of material to be dispensed from a drum with a minimum of effort.

It is also an object of the invention to provide a cone-shaped discharge device for attachment to a drum which may contain either or both internal and external means for preventing internal bridging of the contents of the device and which also provides for controlled and, if desired, metered discharge of the contents thereof.

An additional object of the invention is to provide a device which enables ordinary shipping drums to be used as dispensing storage bins or hoppers.

Another important object of the invention is to provide a device of the character described which attaches quickly and easily to a drum by means of a quick-acting clamp and which has integral handles to facilitate ease of positioning and placement thereof upon an open drum.

Attendant objects of the invention are to provide a dustproof drum closure and dispenser of the type described which can be easily and economically produced from strong and corrosion-resistant materials, which is strong and sturdy in construction, and which is highly efficient in operation.

These and other related objects of the invention will be apparent to those skilled in the art from a consideration of the description which follows. The various features and details of construction of the invention are more fully set forth herein with reference to the accompanying drawings, wherein like reference numerals designate like parts, and wherein further:

FIGURE 1 represents a fragmentary elevation partially cut-away showing one embodiment of the invention being used as a storage bin or hopper in connection with a standard drum.

FIGURE 2 represents an isometric view of an embodiment of a locking band which may be used in connection with the invention.

FIGURE 3 represents a partial fragmentary section through an embodiment of the invention used in connection with a steel drum.

FIGURE 4 represents a partial fragmentary section through an embodiment of the invention used in connection with a fibre drum.

As shown in the figures, the invention generally comprises a funnel-shaped, hollow frustum or generally frusto-conical portion A which is removably attached, by a locking band B, to a standard drum C.

Frusto-conical portion A which, as shown, is generally funnel-shaped, includes tapered wall portions **10** which terminate at their base with an integral outwardly extending annular flange **11**. A resilient gasket **12** made of rubber, polymers of chloroprene, or other suitable materials may be provided and this annular gasket, which generally complements flange **11** is affixed to the face of the flange, as shown in FIGURES 3 and 4. The funnel A may be further provided with a discharge section **13** which may be integral with the apex portion **14**.

In the embodiment shown in FIGURE 1, a first valve **15** is shown, intermediate discharge section **13** and apex portion **14**, and serves to connect the two. A second valve **16** may also be provided, to which may be attached an auxiliary discharge section **17**. The valves serve to control the flow of materials out of the hollow frustum A whereas the discharge sections **13** and **17** serve to direct the material into a receiving container in a dustproof and positive manner. Since the volume of discharge section **13** may be predetermined, seriatim opening and closing of valves **15** and **16** serves to meter the discharge from the cone.

The cone may be further provided with a vibrator **18** (of any conventional type) and a plurality of handles **19** for ease of placement and manipulation.

The cone and discharge sections **13** and **17** may be made of any suitable material. It is preferred to use strong ferrous or nonferrous metals which are selected for their corrosion resistance vis-a-vis the products being handled. Coated metals may also be used. Vibrator **18** prevents granular material from bridging over the outlet within the interior of the cone and is especially useful for hygroscopic materials. Valves **15** and **16** may be of any conventional slide or variable orifice type and may be either manually operated or operated automatically as part of a programmed system.

As best shown in FIGURE 2, the removable locking band B may take the form of a split ring, hinged at an intermediate portion thereof as with hinge **20**. The band further includes longitudinally extending side walls **21** which are provided with longitudinally spaced internal peripheral detents. As shown in FIGURE 2, these detents may comprise a first toroidal bead **22** and a second toroidal bead **23** longitudinally spaced apart from the first bead. Both of these beads, which may conveniently be fabricated from steel rod stock, are fixedly attached to side walls **21**, as by welding. The dimensions of bead or detent **22** are such as to enable it to simultaneously contact flange **11** and tapered wall portion **10**.

Locking band B also includes a quick acting clamp such as toggle clamp, generally **24**. The clamp **24** includes a hasp **25** and a latch **26**, mounted on threaded shaft **27** which terminates in a handle **28**. Shaft **27** is threadedly and pivotally mounted in a yoke **29** which, in turn, is pivotally affixed to side wall **21**. Shaft **27** may be retained against the exterior of the band, when the toggle is in closed position, by a pivoted retaining lug **30**. Band B is closed by abutting the two open ends of side wall **21** and placing latch **26** within the hook of hasp **25**. Thereafter operating handle **28** is moved over the pivot center of yoke **29** to place the band in compression. Adjustments in compressive force may be made by rotating handle **28** and thus positioning shaft **27** prior to engagement of the clamp.

The drums C are of any conventional type. It is contemplated that the cone A be dimensioned for the particular drums C which will be utilized. In FIGURE 3 a steel drum is shown. Such drums include side walls **31** which terminate in an integral "curl" or strengthening flange **32**. These steel drums are made in accordance with specifications of the American Standards Association. The specification for steel drums of the 30-gallon size is MH 2.12–1960 and the specification for 55-gallon steel drums is MH 2.2–1959. Thirty-gallon drums customarily have 18¼" internal diameters and 55-gallon drums have 22½" internal diameters.

A fibre drum is shown in FIGURE 4. These drums terminate in a metallic strengthening flange **33** having the configuration shown and the flange includes an external shouldered portion **34**. These drums are also governed by industry-wide standards and come in internal diameters of from 11" to 23".

The operation of the device is generally as follows. A drum is set on the floor in the usual manner and its cover removed. In the case of a steel drum, curl **32** is thus exposed and in the case of a fibre drum, flange **33** is thus exposed. Using handles **19**, cone A is fitted onto the open drum in a position inverted from that shown in FIGURE 1. Appropriate preliminary axial alignment is made again using handles **19**. Locking band B is then placed upon and closed around the joint to achieve the inverse of the configurations shown in FIGURES 3 and 4 (for steel and fibre drums respectively). It will be noted that detent or bead **22** engages the flange **11** of cone A whereas detent or bead **23** engages the remote side of the drum's strengthening flange. Further, side wall **21** is of a length sufficient to span the joint. When the band is fully tightened, as with toggle clamp **24**, side wall **21** (the internal diameter of which is exactly sized for the drum being used) forces drum C and cone A into axial alignment. Furthermore, the distance between detents **22** and **23** is slightly less than the total thickness of flange **11**, gasket **12** and flange **32** or **33** (depending on whether a steel or fibre drum is involved). Consequently, tightening of the toggle clamp **24** produces a simultaneous compression due to the vector of downward force applied to the tapered wall section **10** as the clamp is tightened. This rolling compression or wedging produces strong vectors of axial compression which enable the cone A to support the contents of drum C. In applications where the drum flanges are resilient and partially deformable, gasket **12** may be eliminated and the spacing between detents **22** and **23** decreased to compensate for its absence.

After cone A has been secured to the drum C as described, a conventional materials handling device is used to lift and invert the assembly to the position shown in FIGURE 1 where it may be retained by a rack or other suitable devices until the drum has been emptied. The contents of the drum rest within cone A and are prevented from bridging, as they are dispensed, by action of the vibrator **18**, which may be of any conventional electrical, pneumatic or mechanical type. Flow out of the drum is controlled by valve **15** and, if this is the only valve present, the material flows directly through adapter piece **13** into the receptacle. However, if a second valve **16** is included then discharge section **13**, which has a known volume, can be used for metered incremental discharge. In this application, valve **16** is closed and valve **15** is opened so that section **13** fills. Thereupon valve **15** is closed and, when **16** is opened thereafter, a premeasured volume passes through auxiliary discharge section **17** into the receptacle. The entire operation is dustproof and at the same time provides a closure for drum C.

Apex portion **14** is provided with an internal antibridging device in the form of a cone **35** attached to wall portions **10** as with a plurality of cross bars **36**. The cone is oriented with its apex pointing toward locking

band B and thus serves to limit rate of discharge from cone A as well as to prevent bridging. The diameter of the base of cone **35** is less than the internal diameter of apex portion **14** so as to define an annular flow area.

Although the invention has been described in considerable detail, such description is intended to be illustrative rather than limiting since the invention may be variously embodied and, therefore, the scope of the invention is to be determined only by the appended claims.

Having described my invention, I claim:

1. A dustproof drum closure and dispenser for a drum of the type having a totally removable head and a resilient peripheral strengthening flange which cooperates with said head, comprising a frusto-conical spout having a flat flange radially extending outward from the base thereof which is generally complementary in diameter to said drum strengthening flange; and a locking band having a pair of toroidal shaped detents which are longitudinally spaced apart from each other at their adjacent convex sides by a distance slightly less than the combined thickness of the drum strengthening flange and the flange on said spout; whereby the arcuate convex walls of the toroidal detents act as a wedge, when the locking band is tightened, to force the drum flange and the flange on the spout into compressive dustproof juxtaposition with a force sufficient to enable the drum to be inverted and the material therein to be supported solely by said spout pending discharge therethrough.

2. The closure of claim **1** wherein the toroidal detent which is in contact with said spout flange is of a diameter large enough to simultaneously contact the face of said flange and the wall of said spout so as to cause automatic axial alignment of the drum and said spout when said locking band is tightened.

3. The closure and dispenser of claim **1** which further includes anti-bridging means.

4. A dustproof drum closure and dispenser for a drum of the type having a totally removable head and a peripheral strengthening flange which cooperates with said head, comprising a frusto-conical spout having a flat flange radially extending outward from the base thereof which is generally complementary in diameter to said drum strengthening flange; a resilient compressible gasket interposed intermediate the flange of said spout and the strengthening flange; and a locking band having a pair of toroidal shaped detents which are longitudinally spaced apart from each other at their adjacent convex sides by a distance slightly less than the combined thicknesses of the drum strengthening flange, the flange on said spout, and said gasket; whereby the arcuate convex walls of the toroidal detents act as a wedge, when the locking band is tightened, to force the drum flange, the flange on said spout and said gasket into compressive dustproof juxtaposition with a force sufficient to enable the drum to be inverted and the material therein to be supported solely by said spout pending discharge therethrough.

5. The closure of claim **4** wherein the toroidal detent which is in contact with said spout flange is of a diameter large enough to simultaneously contact the face of said flange and the wall of said spout so as to cause automatic axial alignment of the drum and said spout when said locking band is tightened.

6. The closure and dispenser of claim **4** which further includes anti-bridging means.

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