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L. R. STANLEY

3,074,543

PACKING MATERIAL

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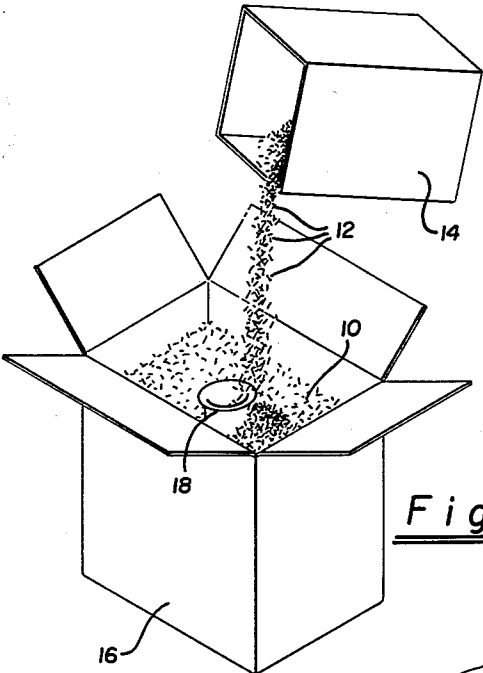


Fig. 1

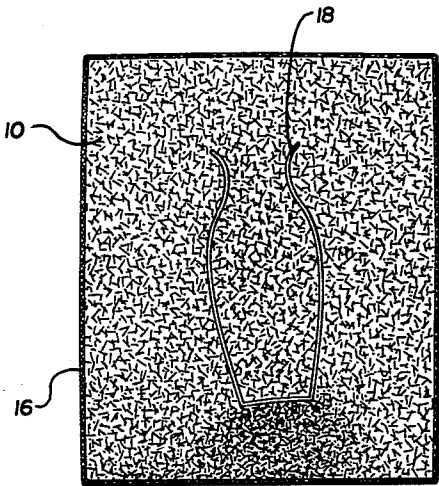


Fig. 2

Fig. 3

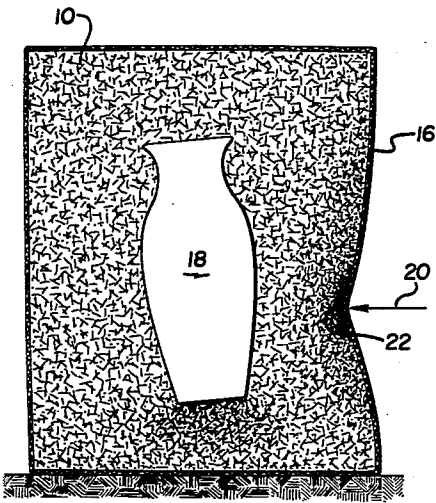
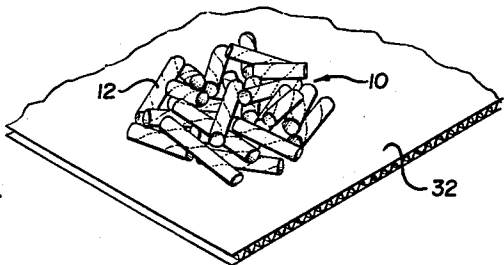


Fig. 4

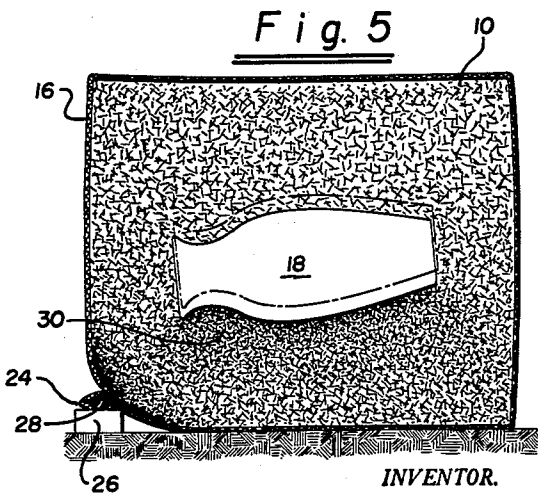


Fig. 5

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3,074,543

PACKING MATERIAL

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11 Claims. (Cl. 206-46)

This invention relates generally to the storage and shipment of frangible items of merchandise, and more particularly to a packing material and method adapted to eliminate breakage of such items. This is a continuation-in-part of my previously filed application Serial No. 722,477, filed March 19, 1958, now abandoned.

As is well known, conventional procedures of packing frangible items such as glassware, art objects, delicate machinery, instruments and the like, call for considerable skill and experience if the items are to survive the period of storage or shipment without damage. In industries where such packing is conducted on a commercial scale, as in long distance moving or department store merchandising, professional packers are almost universally employed. Even the most experienced packers, however, are unable to completely eliminate a substantial amount of breakage due to ordinary handling, road shocks, etc. One difficulty, for example, is a "migration" of the packed item through the packing material due to continuous vibration or impact, as in a van or rail car, until contact is made with a wall of the shipping carton and breakage occurs. Breakage from this and other normal causes customarily runs as high as 15%, and may run considerably higher if any amount of handling of the packaged merchandise is involved. It is evident therefore that a packing material that would eliminate the losses due to breakage is highly to be desired.

The prior art has employed many different types of packing in an effort to reduce breakage, wood shavings, shredded paper, excelsior, and corrugated strips of cardboard being the most familiar types. Although each of these materials possesses certain advantages for specific uses, they all have in common certain specific shortcomings:

(1) They are not readily employed with delicate or hollow objects of odd shapes. Many objects are broken by attempts to stuff interior spaces with the packing material, or objects may be broken by shear stresses due to a shifting or layering effect of loose granular packing materials, such as sawdust.

(2) They require considerable skill in their handling, necessitating skilled, expensive labor.

(3) They do not lend themselves to rapid, machine-type packing operations, as all operations must be performed by hand.

(4) They are only about 85% effective.

In general, it is an object of the present invention to provide a simple solution to the above and to additional problems and to provide a loose flowable packing material that can be easily employed in packing operations by unskilled labor.

Another object of the invention is to provide a packing material that is readily adaptable to machine-type, production-line packing techniques.

Another object of the invention is to make available an inexpensive packing material that virtually eliminates the breakage problem.

A still further object of the invention is to provide a shipping carton for frangible items of merchandise that will act to prevent breakage of the merchandise under even the roughest of handling.

Other objects and advantages of the invention will appear from the following description and from the drawing in which:

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FIGURE 1 is a view in perspective of a quantity of packing material embodying the invention;

FIGURE 2 is a like view illustrating a carton packing operation in accordance with the invention;

5 FIGURE 3 is a view in vertical section showing a use of the packing material of FIGURE 1 in a carton that has been sealed for shipment or storage;

FIGURE 4 is a like view showing the manner in which a sharp blow or shock is absorbed by the packing material; and

10 FIGURE 5 is a similar view likewise showing the manner in which the packing material protects the packaged item from breakage.

In general, the present invention is based on the discovery that a loose mass of tiny collapsible cylinders, for example, waste or cut straw stock, possesses qualities of resilience and substantial crushability that makes it ideal for use as a packing material. In addition, it has been found that the loose mass of cylinders has a ready flowability so that it can be poured into recesses and openings of oddly shaped items, and within the confines of a shipping carton, in such manner as to completely isolate the packed item from the sides of the carton. Such a packing operation can be performed in a few minutes time by even the most unskilled laborer, and will provide a packed carton capable of absorbing a maximum amount of handling and shocks with a minimum of transference of such shocks to the packaged item. Moreover, the packing mass is itself incapable of transferring shear or bending stresses to the protected item. As will appear, these unique qualities of the new packing material are attributable primarily to the crushability or shock-absorbing characteristics of the loose mass, coupled with an initial tendency of the individual cylinders to retain an uncollapsed shape.

Referring to the drawings in detail, FIGURE 1 illustrates a quantity of the new packing material arranged in a characteristic loose random mass 10. This mass comprises a multiplicity of small cylinders 12 of relatively short length. In the preferred form illustrated, the cylinders 12 are fabricated from a relatively stiff, sized paper, and may advantageously comprise conventional, spirally-wound and glued straw stock, such as "straw ends" obtained as a waste product from the manufacture of drinking straws. Such waste stock is readily available and heretofore has been discarded or burned as a useless by-product. I have found however that these hollow straw ends, while essentially shape-retaining as individual units, have a crushability as a loosely compacted mass that renders them unusually shock absorbent. For example, if a handful of the straw ends 12 are lightly squeezed, their inherent stiffness and resilience will allow them to return almost to the original volume. However, a forceful squeeze representative of a sharp blow exerted on a confined mass 10 of the straw ends will cause a substantial deformation or crushing of the mass, indicating the ability of the mass to absorb the force of the blow. This crushability is due in part to a breakdown of the initial stiffness imparted to the straw stock by the sizing and similar coating materials normally employed. It also results from the cylindrical shape of the packing units 12, which allows air to be expelled from either end of the cylindrical unit so that crushing may occur. At the same time both such stiffness and the cylindrical shape act to prevent a matting or compacting of the material to form a dense mass capable of transferring shear stresses.

Although straw ends are to be preferred, the cylinders 12 may be conveniently fabricated of various materials. By way of illustration, the cylinders can be cut from continuously extruded tubes of a suitable resinous or plastic material (e.g. thermoplastics such as polyethylene, vinyl

or nylon, or thermosetting resins such as the phenolics, alkyd or epoxy resins, etc.). The cylinders might also be made of a composition material including a quantity of an elastomer or natural rubber. The particular composition of the cylinders will depend to some extent on the nature of the items to be packed and the degree of protection required. In any event, it is essential that the cylinders possess a certain degree of crushability or deformability so that shock will not be transmitted through the loose mass of the cylinders to a packed or protected object. Such characteristics can be advantageously obtained by also coating tiny paper-like cylinders with a resinous or rubbery material, of the type described, with the thickness of the coating giving a degree of control over the resilient or shape-retaining characteristics of the cylinders in the loose unpacked mass.

One particular advantage of cylinders having a resilient or rubbery exterior surface is an increased resistance to "migration" of a product through the packing material. The effect of the surface, particularly under pressure, is to increase the abrasiveness of the cylinders, one against the other, so that the sliding characteristic is reduced. Under conditions of repeated shock or vibration, this abrasiveness tends to lock the cylinders in place so that any substantial movement of the item being shipped is prevented. There is no reduction however in the degree of crushability or deformability of the material so that a maximum of protection against breakage is retained. In the use of cylinders of this type, I have found that best results can be obtained by packing the shipping carton with a slight excess of material so that the material is pressure loaded to some extent upon being sealed. The effect is to increase the frictional resistance to migration, or, if desired, a surface or coating may be employed that actually develops an adhesive characteristic under pressure.

FIGURE 2 illustrates a typical packing operation in which a quantity of the cylinders 12 is being poured from a container 14 of the packing material into a shipping carton 16. As illustrated, the packing material is being poured all around and within the hollow opening of a fragile vase 18 being packed within the container. This quality of pourability of the packing material makes it readily adaptable to high speed machine-type packing operation such as might be used on a production line in the packing of a large quantity of identical items. It is of equal value in permitting a rapid efficient packing of shipping cartons by hand, particularly as no special skills are required in the performance of the packing operation.

In carrying out the invention, it has been determined that the desired qualities of initial non-collapsibility, pourability, and crushability of a packing mass 10 can be obtained when the individual packing units 12 have a diameter ranging from about $\frac{1}{16}$ inch to $\frac{1}{2}$ inch, and a length to diameter ratio of from about 4 to 1 to 8 to 1. A particularly satisfactory packing is comprised of straw ends having an average diameter of units 12 between about $\frac{1}{8}$ to $\frac{1}{4}$ inch and a length to diameter ratio of about 5 or 6 to 1. If the diameter of the straw ends is substantially increased, or if the units 12 are excessively long in relation to diameter, an undesirable matting or self-packing of the loose mass 10 may occur. On the other hand, a too small diameter, or a too short length to diameter ratio, may substantially reduce the characteristic crushability of the packing mass.

FIGURE 3 illustrates a sealed shipping carton 16 completely filled with a loose mass 10 of the packing material. It will be noted that no additional wrapping or packing material other than the straw ends 12 has been employed. A packed unit of this type, comprising the stiff outer walls of the carton confining the loose interior packing mass, has been found to completely isolate a packed item from all but the severest external blows. This is because the force or shock of impacts, for example as at 20 in FIGURE 4, is virtually absorbed by the

mass of packing material. This effect is illustrated in the shaded area 22 of FIGURE 4, where the force of the blow has resulted in the crushing of the paper-like cylinders all about the point of impact. In contrast, a conventional packing would have transmitted an appreciable portion of the shock to the packed item 18, and possibly have caused its damage.

FIGURE 5 further illustrates the protective effect of the packing material in an instance in which the shipping carton falls or is tipped from a normal vertical position. As shown, the impact caused by the corner 24 striking a board, brick or other object 26 has caused the corner mass 28 of packing material to collapse and thereby absorb the blow. Also demonstrated is the effect of inertial displacement of the vase 18 within the packing mass due to its own weight, as represented by the final position of the vase (solid lines) as related to its original position (dotted lines). The compacting or deformation of the packing mass to absorb the blow, and also to resist further migration of the vase, is represented at 30. It should be further noted that there is no transference of shearing stresses through the packing mass to the protected item.

From the above description, it will be apparent that the present invention makes possible a rapid efficient packing of a wide variety of oddly shaped items, such as glassware, instruments, china, delicate machinery, etc., by a simple procedure involving only the pouring of the packing mass into and about the item to be shipped. Moreover, the procedures necessary in carrying out the invention require no knowledge or skill in particular packing techniques, and can be rapidly carried out by hand, or by machinery.

To those skilled in the art to which this invention relates, many variations and widely differing applications and embodiments of the invention will suggest themselves without departing from the spirit and scope of the invention. For example, in the packing of flatware such as china plates, trays, etc., it may frequently be desirable to employ divider members such as the corrugated cardboard dividers 32 illustrated in FIGURE 1. As each divider member will support its own individual mass of packing material 10, the net effect is to localize shock transference to a particular compartment or compartments of a container unit.

It should be further understood that the phrase "fragile items" as used herein is not intended to be limited solely to any particular type of merchandise, as many different items of commerce may be successfully protected by use of the new packing material. Specifically, it is contemplated that the crushable cylinders of the invention may be employed in the shipping or storage of delicate electronic or mechanical equipment or instruments, optical equipment, light bulbs, items of food such as eggs, jars of fruit, etc. They can also be used in the shipment of explosives, chemicals, or similar materials. Moreover, the protection provided herein is more than merely the prevention of visible breakage or crushing of packaged items of their containers. By way of example, many items of merchandise such as electronic equipment, timers, optical equipment, etc. show no visible signs of breakage as a result of shock, but may be rendered useless because of changes in position, alignment, or adjustment of the parts. It is contemplated that the invention will prove of equal use in the shipment or storage of these and many other merchandisable items.

I claim:

1. A package containing a fragile article comprising an outer container, and a resilient packing material confined within the container, such packing material comprising short, resilient, thin walled paper open hollow tubes arranged in haphazard relationship and closely packed around the article and holding such article in spaced relation to the sides of the container.
2. A package containing a fragile article comprising

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an outer container, and a resilient packing material confined within the container, such packing material comprising short, resilient, thin walled plastic open hollow tubes arranged in haphazard relationship and closely packed around the article and holding such article in spaced relation to the sides of the container.

3. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose pourable, substantially shape-retaining mass of crushable cylinders, each of said cylinders being of a hollow shape-retaining construction capable of substantial crushing in response to an external force, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

4. An article as in claim 3 wherein said hollow cylinders have an average diameter of between about $\frac{1}{16}$ and $\frac{1}{2}$ inch.

5. An article as in claim 4 wherein the ratio of the length of said hollow cylinders to their diameter is between about 4:1 and 8:1.

6. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose pourable, substantially shape-retaining mass of hollow crushable cylinders, said hollow cylinders being paper cylinders coated with a sizing material, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

7. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose pourable, substantially shape-retaining mass of hollow crushable cylinders, said hollow cylinders being straw ends, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

8. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose pourable, substantially shape-retaining mass of hollow crushable cylinders, said hollow cylinders being of a plastic construction, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

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9. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose pourable, substantially shape-retaining mass of hollow crushable cylinders, said hollow cylinders being paper cylinders coated with a resinous material, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

10. As a new article of manufacture, a shipping carton for frangible items, such carton and the hollow spaces within a shipped item being completely filled with a loose, pourable, substantially shape-retaining mass of hollow crushable cylinders, said hollow cylinders being coated on an outer surface with a substance providing a slip resistant surface, whereby said loose mass functions to provide a maximum absorption of shock with a minimum of shear stress transference.

11. As a new article of manufacture, a shipping carton for frangible items, said carton being subdivided by divider members into a plurality of compartments for shipped items, each of said compartments and the hollow spaces within shipped items being completely filled with a loose pourable, substantially shape-retaining mass of hollow crushable cylinders, said divider members serving to localize transference of shock to a particular compartment, whereby said divider members and said loose mass of cylinders function to provide a maximum of absorption of shock with a minimum of shear stress transference.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,074,543

January 22, 1963

Lorne R. Stanley

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 to 3, for "Safe-T Pacific Baking Company, of San Francisco, California," read -- Safe-T Pacific Company, of Redwood City, California; line 12, for "Safe-T Pacific Baking Company, its successors" read -- Safe-T Pacific Company its successors --; in the heading to the printed specification line 4, for "Safe-T Pacific Baking Company, of San Francisco, Calif." read -- Safe-T Pacific Company, Redwood City, Calif. --.

Signed and sealed this 3rd day of September 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents