

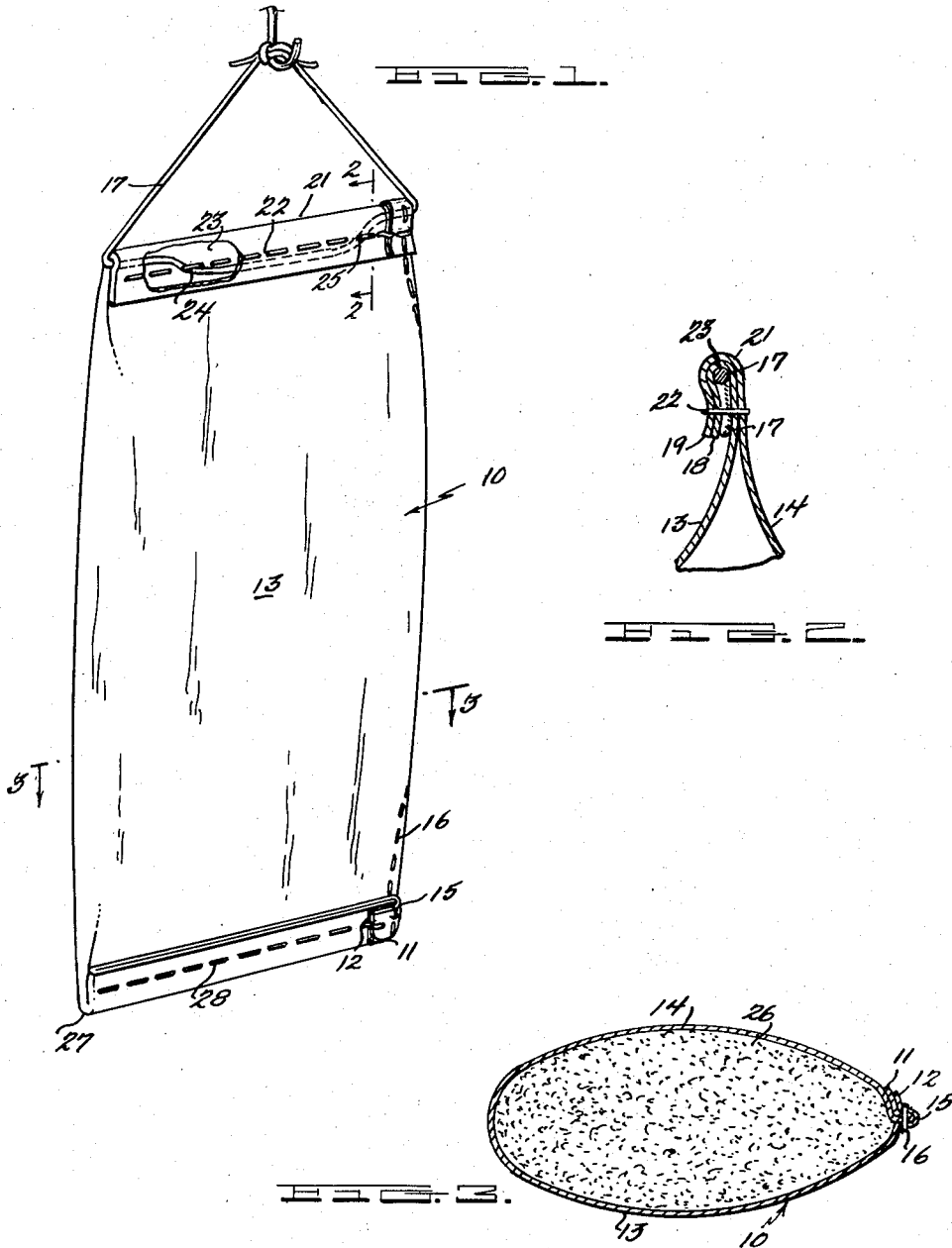
Aug. 25, 1953

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HUMIDIFIER PACKAGE WITH STITCHED-IN SUSPENSION
MEANS AND METHOD FOR MAKING SAME

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2 Sheets-Sheet 1



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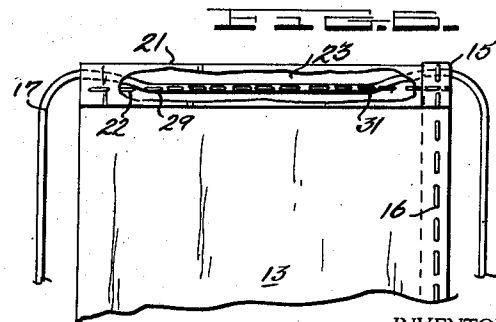
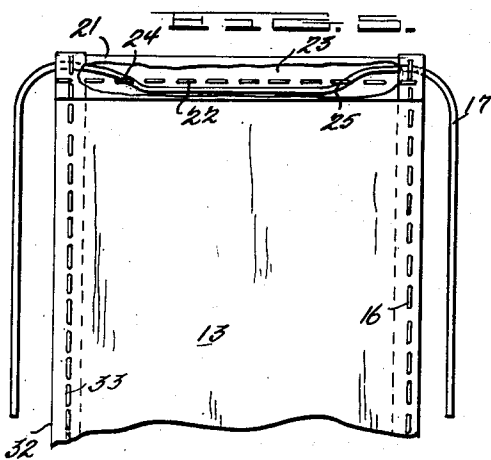
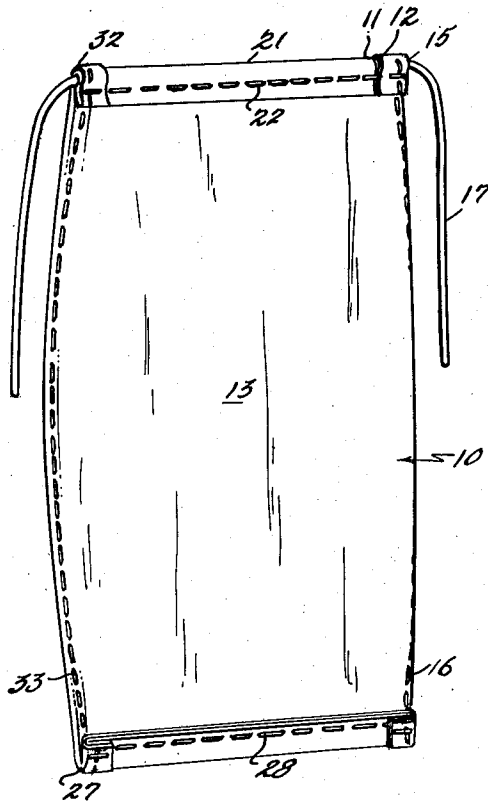
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FIG. 4



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HUMIDIFIER PACKAGE WITH STITCHED- IN SUSPENSION MEANS AND METHOD FOR MAKING SAME

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12 Claims. (Cl. 183—4.8)

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This invention relates to non-woven bags and more particularly to a novel method and structure for securing tie strings to non-woven bags to provide a packaged desiccant which may be safely suspended from the tie strings for long periods.

By "tie strings" throughout the specification and claims is meant a firmly anchored cord, preferably about five inches in length, by which the bags may be suspended from an object.

A high humidity of the ambient atmosphere causes serious corrosion of metallic objects stored for long periods. This problem is especially serious in the storing of accurately machined articles such as airplane, and other machine, parts. One method of preventing corrosion that has been developed is to package the articles to be stored in a confined space with a desiccating material which reduces and controls the humidity of the confined air within limits where corrosion is not serious. This method has been used extensively by the government to protect articles during shipment as well as storage. The desiccants were heretofore packaged in a laminated jeans cloth bag having a tie string anchored to the bag to permit the bag to be suspended within the package.

In order to avoid sifting of the desiccant through the interstices, the jeans cloth bag is ordinarily laminated with a non-woven material which permits the passage of moisture through the bag but prevents sifting. Attempts to substitute non-woven bags for the laminated jeans cloth bag have generally resulted in failure of the bags because of the severe vibrations which they encounter in use and particularly during shipment. Failure of non-woven bags constructed according to the methods heretofore available was generally caused by tearing at the end stitches on each side of the bag in the line of stitches anchoring the tie string to the bag. As a result of the excessive failure of non-woven bags that was encountered the government set up extremely rigid vibration tests for non-woven bags designed to be substituted for the jeans cloth bag.

It is an object of this invention to provide a novel method of anchoring tie strings to the bags.

Another object of this invention is to provide

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a non-woven bag with a tie string securely anchored thereto.

A further object of this invention is to provide a novel desiccant package for suspension within a confined space to control the humidity of the atmosphere.

Another object of this invention is to provide a desiccant packaged in a porous non-woven bag having a tie string anchored in a portion of a seam of the bag spaced from the ends of the seam.

With these and other objects in view, as will appear in the following detailed description, this invention resides in anchoring a tie string to a seam of the bag by catching the tie string in the seam with at least one full stitch of the seam on each side of its engagement with the tie string.

In the drawings:

Figure 1 is a perspective view of the novel package of desiccating material of this invention in a suspended position.

Figure 2 is a sectional view along the section line 2—2 in Figure 1 showing the position of the tie string relative to a folded end of the bag.

Figure 3 is a horizontal sectional view along the section line 3—3 in Figure 1 illustrating the desiccant within the package.

Figure 4 is another embodiment of this invention especially adapted for use with large bags of desiccating material.

Figure 5 is a front elevation of an improvement of this invention partly broken away illustrating one method of anchoring tie strings in the seam.

Figure 6 is also an elevation of a bag with a return fold partly broken away to show a second means of anchoring the tie string in the seam according to this invention.

Referring to Figure 1 of the drawings, a bag, indicated generally by reference numeral 10, may be prepared according to this invention by folding a blank of non-woven material with its side edges 11 and 12 in alignment to form a front panel 13 and a rear panel 14. In the bag illustrated in Figure 1, the edges 11 and 12 are return folded at 15 against the rear panel 14 and secured in place by stitches 16. In this manner a tubular structure open at both ends is formed.

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A tie string 17 is placed on the front panel 13 at its upper end 18. The upper ends 18 and 19 of the front and rear panels 13 and 14, respectively, are return folded at 21 against the front panel 13. The ends 18 and 19 are then secured to the panels 13 and 14 by a thread forming a stitched seam 22.

The seam 22 is spaced sufficiently far from the returned fold 21 to provide a tunnel 23 between the seam and the returned fold. The thread forming seam 22 catches tie string 17 by passing through the tie string at stitches, such as 24 and 25, having at least one additional full stitch between those stitches and the sides of the bag. By "full" stitch is meant a complete loop in the thread of the seam and includes two passes of the thread of the seam through the fabric of the panels. Thus the tie string is caught as the thread of the seam is in at least the third pass through the panels from each side of the bag. Ordinarily the seams of the container will have about 4 or 5 stitches per inch and thus the minimum distance between the stitch catching the tie string and the side of the bag is about $\frac{3}{8}$ inches. In the preferred form of the invention, the last stitch catching the tie string is spaced at least $\frac{3}{4}$ inch from each side of the bag. The tie string 17 extends from stitches 24 and 25 through the tunnel 23 and emerges at the sides of the bag.

The stitching of seam 22 provides a non-woven container of a bag-like shape having one end closed and a tie string enclosed in the seam making the closure. The container is ready for filling with the desiccant to form a package for suspension in an enclosed space for control of the humidity.

The bag 10, illustrated in Figure 1, is then inverted, filled with the desiccant material indicated by reference numeral 26 in Figure 3 and then the lower end of the bag is closed by conventional fold 27 and seam 28. The desiccating material may be any of the usual desiccants such as silica gel, activated alumina, magnesia, Filtrol, an acid activated clay, etc. Any of the conventional solid desiccant materials are, in general, suitable. It will be appreciated, however, that deliquescent materials such as calcium chloride are not satisfactory where large amounts of water vapor must be taken up. Obviously the properties of the desiccant such as moisture stripping ability, capacity, hardness, corrosive properties, etc. as well as cost will influence the final selection of the desiccant.

The non-woven material forming the bag 10 must be permeable to moisture to permit control of the humidity within the confined space within which the package is suspended, but the openings in the non-woven material must be sufficiently small so that dust of the desiccant will not sift through the bag. Any dust sifting through the bag may be extremely abrasive to the highly polished machine parts which it is desired to protect. A felt-like non-woven fabric having sufficient strength and suitable porosity for use in the desiccant package of this invention may be prepared by a random distribution of about 2.8 ounces of cotton fiber in 1.53 ounces of a synthetic latex binder, such as butadiene styrene copolymer, per square yard of material. Such material will have a tensile strength of about 17 pounds per 1 inch strip in all directions and a porosity allowing 50 cubic feet of air per minute per square foot of fabric on a standard

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Frazier air permeability machine and an average bursting strength of 75 pounds. While the material herein described in detail is particularly satisfactory for use in a desiccant package, it will be appreciated that this invention is not limited to that material, which is described only as a specific example of a material suitable for this invention.

The method of anchoring the tie string 17 in the seam 22 may be varied, it only being necessary that at least one full stitch of the seam lie between the last stitch engaging the tie string and the side of the bag. Referring to Figure 5, the tie string 17 is engaged by a single stitch 24 and then passes below the seam 22 to the right hand side of the bag and is there caught by a stitch 25. The ends of the tie string 17 outside of the stitches 24 and 25 pass through the tunnel 23 to the sides of the bag.

A modification of the invention is illustrated in Figure 6 of the drawings. In this form the stitches of seam 22 catch the tie string 17 for its full length between the outer stitches 29 and 31 on each side of the seam engaging the tie string. Here again there is at least one full stitch of the seam 22 between the sides of the bag and the stitches 29 and 31, respectively.

When the tie string is anchored to the bag according to this invention the principal stress resulting from vibration of the suspended package is borne by the outer stitches of the seam 22 engaging the tie string. However, the stitches between the outer stitches engaging the tie string and the sides of the bag provide additional support and help distribute the load to prevent failure of the package. Moreover, the return fold 21 engages the tie string 17 and also supports a portion of the load on the tie string. In the manner of anchoring the tie string employed heretofore, the load was borne entirely by the outer stitches of the seam engaging the tie string and failure of the stitches or the bag frequently resulted.

When a large package containing as much as one pound or more of desiccant is employed, it is ordinarily necessary to further reinforce the package to prevent bursting or tearing of the bag under the weight of the desiccant. Such reinforcement is accomplished by the structure illustrated in Figure 4 of the drawings in which the side of the panels 13 and 14 opposite the seam 16 is return folded at 32 and stitched to the panels 13 and 14 by seams 33.

While this invention has been described in detail with respect to a particular modification of the invention, it is to be understood that the concept of this invention is not limited to those details, but is determined by the scope of the appended claims.

I claim:

1. A package for suspending in a confined space to control the humidity of the atmosphere therein comprising a non-woven bag having its top edge folded over against one surface of the bag, a stitched seam securing the folded over top edge to the bag, and extending to the sides thereof and a tie string anchored to the bag by the seam toward each side of the bag at points spaced from said sides at least one full stitch of the seam for suspension of the package, and a desiccant within the bag, said non-woven bag having a porosity allowing moisture to diffuse into the desiccant for control of the humidity of the confined space.

2. A package for suspending in a confined space

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to control the humidity of the ambient atmosphere comprising a bag of non-woven material, one end of the bag being return folded against the bag, a tie string lying underneath the return folded end of the bag, a seam securing the return folded end of the bag to the bag, said seam stitched along a line spaced from the return fold to provide a tunnel between the seam and the return fold, stitches of the seam engaging the tie string toward each side of the bag but spaced from said side at least one full stitch of the seam to anchor it firmly to the seam, the ends of said tie string passing through the tunnel and extending outwardly from the sides of the bag, a desiccant for the absorption of moisture within the non-woven bag, said non-woven bag having a porosity allowing the moisture of the ambient atmosphere to diffuse through the walls of the bag to the desiccant.

3. A package for suspending in a confined space to control the humidity of the atmosphere therein comprising a bag of a non-woven material, the ends of the bag being return folded against the bag, a tie string lying under the return folded end of the bag, a seam stitched along the ends of the bag to secure the return folded ends to the bag along a line spaced from the return fold to form a tunnel between the return fold and the seam, said seam engaging the tie string along the middle portion of the seam from a position spaced at least one full stitch from one side of the bag to a position spaced at least one full stitch from the other side of the bag, a desiccant within the bag for the absorption of moisture from the ambient atmosphere, said non-woven material having a porosity permitting passage of moisture through the bag whereby the desiccant controls the humidity of the ambient atmosphere within the confined space.

4. A package for suspending in a confined space to control the humidity of the ambient atmosphere comprising a bag of a non-woven material, the ends of the bag being return folded against the bag, a tie string lying under the return folded ends of the bag, a seam stitched along the ends of the bag to secure the return folded ends to the bag along a line spaced from the return fold to form a tunnel between the return fold and the seam, said seam engaging the tie string along the middle portion of the seam from a position spaced at least one full stitch from one side of the bag to a position spaced at least one full stitch from the other side of the bag, silica gel within the bag for the absorption of moisture from the ambient atmosphere, said non-woven material having a porosity permitting passage of moisture through the bag whereby the silica gel controls the humidity of the ambient atmosphere within the confined space.

5. An open ended container adapted to be filled with a desiccant and closed for suspending in a confined space to control the relative humidity of the ambient atmosphere comprising a non-woven bag having one end thereof return folded against the bag, a tie string underlying the returned fold, a seam stitched along the return folded end to secure it to the bag, said seam being spaced from the return fold to provide a tunnel between the return fold and the seam, the stitches of said seam engaging the tie string from a position spaced at least one full stitch from one side of the bag continuously to a position spaced at least one full stitch from the other side of the bag to anchor the tie string in place, the ends

of said tie strings extending outwardly through the tunnel from each side of the bag, said non-woven material having a porosity allowing the passage of moisture therethrough.

6. A method of securing a tie string in a non-woven bag comprising the steps of return folding one end of the bag against the main body of the bag, placing a tie string under the return folded end of the bag adjacent the return fold, stitching a seam along the return folded ends at a position spaced from the return fold to secure the return folded ends to the bag, said seam engaging the tie string at points toward each side of the bag spaced at least one full stitch from the adjacent side of the bag whereby stresses on the tie string are transmitted to stitches of the seam other than the end stitches.

7. A method of anchoring tie strings to non-woven bags comprising return folding an end of the bag against the bag, placing a tie string under the return folded end and adjacent the return fold at the sides of the bag, stitching a seam securing the return folded end of the bag to the bag and engaging the tie string continuously along a length from a position spaced at least one full stitch from one side of the bag to at least one full stitch from the other side of the bag whereby the bag may be suspended and stresses are transmitted from the tie string to stitches other than the end stitches in the seam.

8. A method of securing tie strings to non-woven bags comprising return folding one end of the bag against the bag, placing a tie string in a loop below the return folded end of the bag and adjacent the return folds at the side of the bag, stitching a seam engaging the return folded end of the bag to secure it to the bag and crossing the tie string at each end of the loop at points spaced at least one full stitch of the seam from each side of the bag.

9. A method of forming a bag having a tie string secured therein comprising folding a blank of non-woven material to place its opposite edges in alignment adjacent one another to form a front and rear panel, return folding the adjacent edges against one of the panels, stitching a first seam to secure the return folded edges to the panel, return folding the side opposite the first seam against a panel and stitching a second seam along the length of the return fold to secure the side against the panel, return folding one end of the bag against a panel, placing a tie string under the return folded end, and stitching a third seam securing the return folded end to the panel and anchoring the tie string in the seam, said tie string extending from the sides of the bag between the panel and the return folded end and anchored in place by the third seam engaging the tie string at each side of the bag at a distance at least one full stitch inwardly from the adjacent side of the bag.

10. A package for the control of the humidity of a confined space comprising a non-woven bag having a main body portion, each side of the bag having its edge return folded against the main body portion and secured thereto by a stitched seam, one end of the bag being return folded against the main body portion of the bag, a tie string underlying the return folded end, a seam stitched to the return fold end to secure it to the main body portion of the length of the seam, the outermost portion of the seam at each side of the bag engaging the tie string at a point spaced at least one full stitch of the seam from

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the nearest side of the bag, the ends of the tie string extending outwardly from the side of the bag between the seam and return folded at the end of the bag, a desiccant within the bag, said non-woven material having a porosity permitting flow of the ambient atmosphere through the walls of the bag to the desiccant whereby the humidity of the atmosphere may be controlled.

11. A package as set forth in claim 2 and in which a central length of the tie string along the seam is free of the seam.

12. A package as set forth in claim 11 and in which said central portion of the tie string which is free of the seam is disposed beneath the seam.

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