July 1, 1969 P. BARNISH ET AL 3,452,803

HINGED SELF-LOCKING CLOSURE DEVICES

Filed Aug. 30, 1967 Sheet 1 of 4

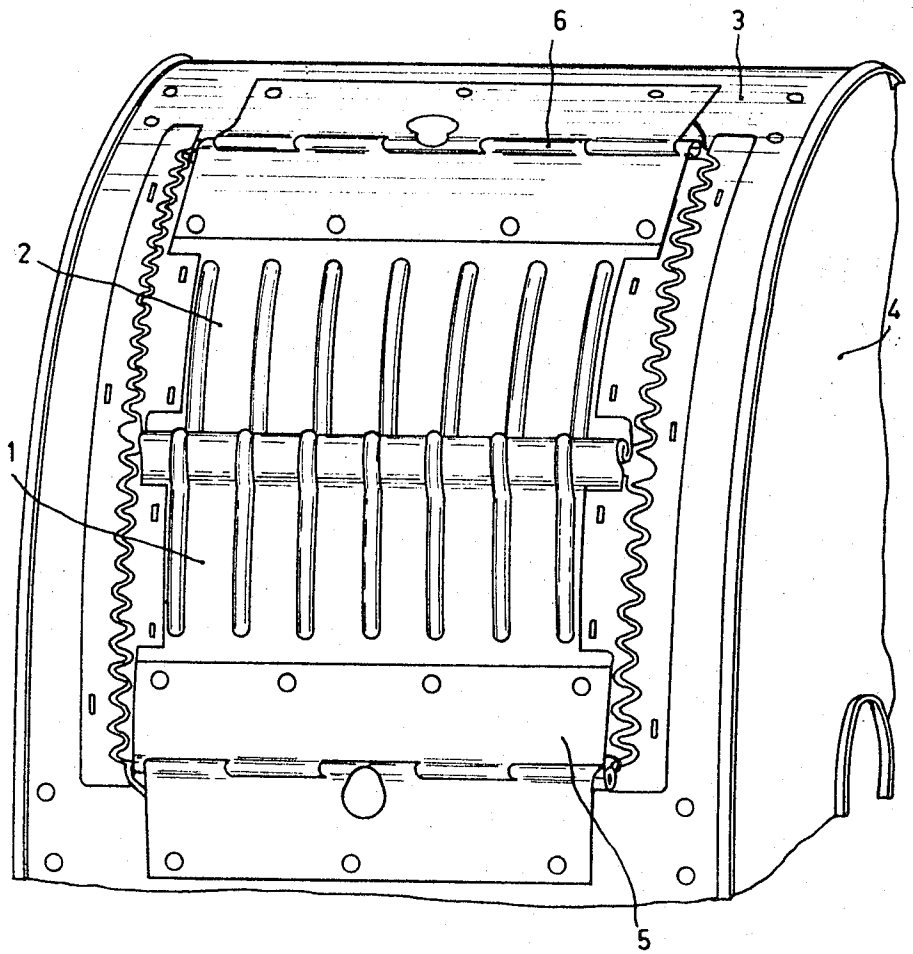

FIG. 1

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Filed Aug. 30, 1967 Sheet 2 of 4

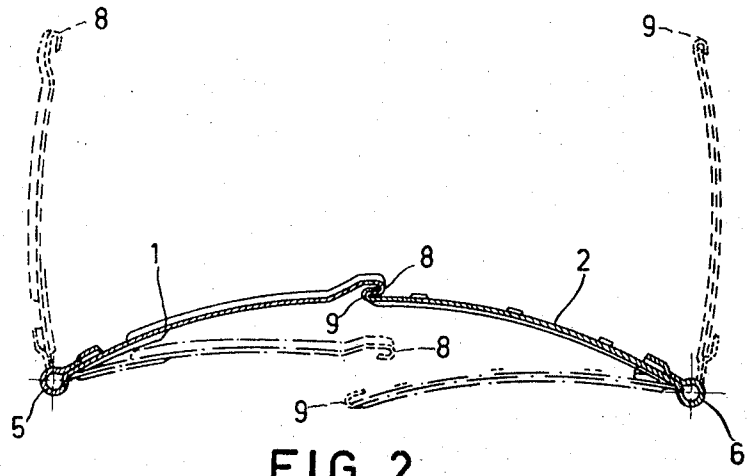

FIG. 2

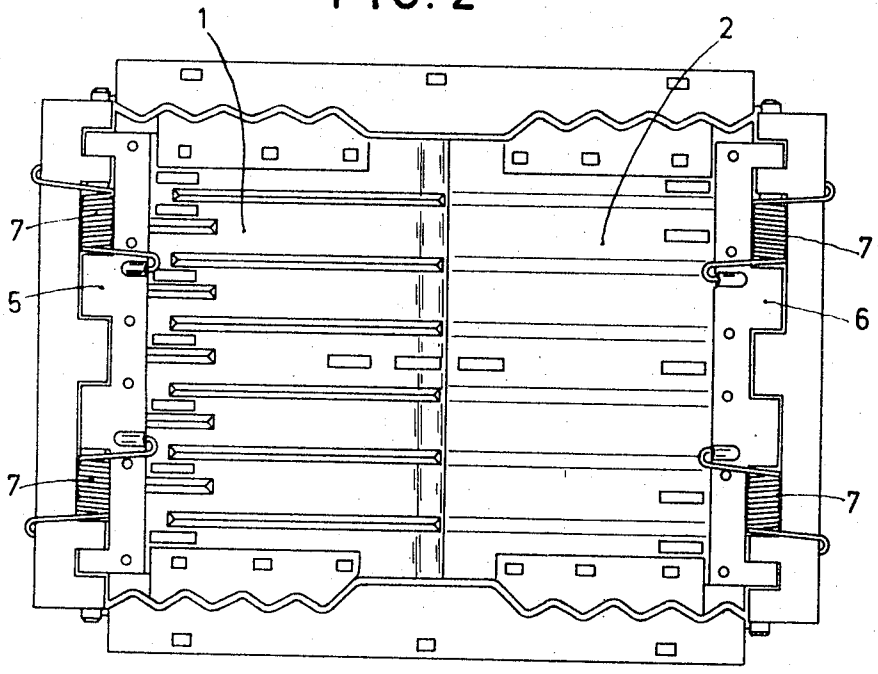

FIG. 3

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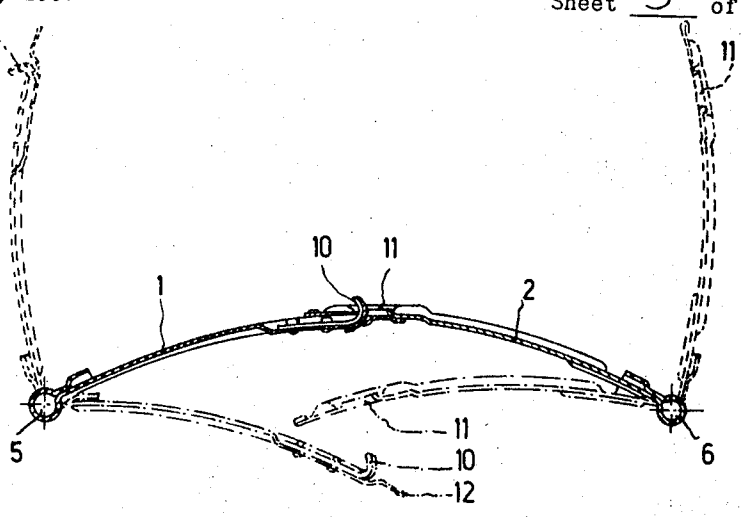

FIG. 4

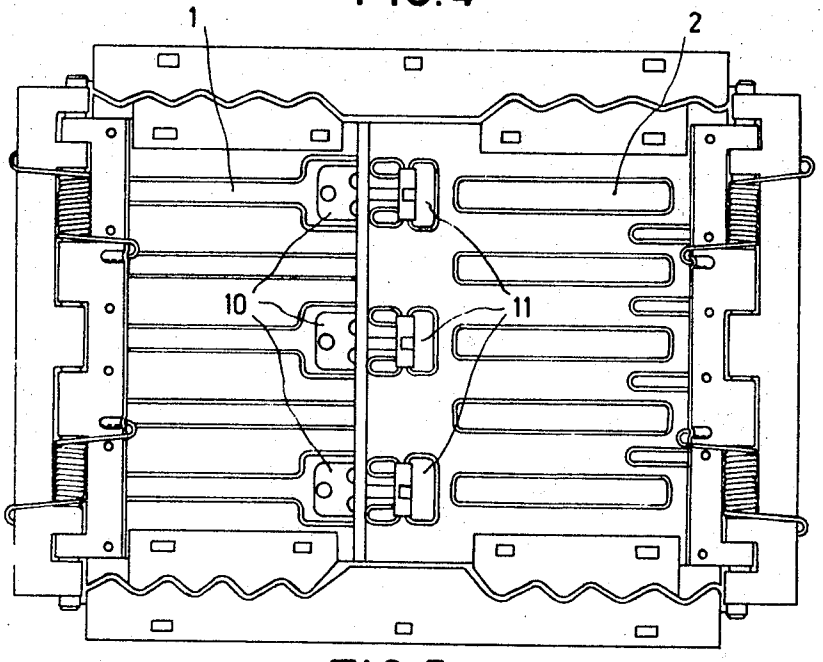

FIG. 5

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HINGED SELF-LOCKING CLOSURE DEVICES

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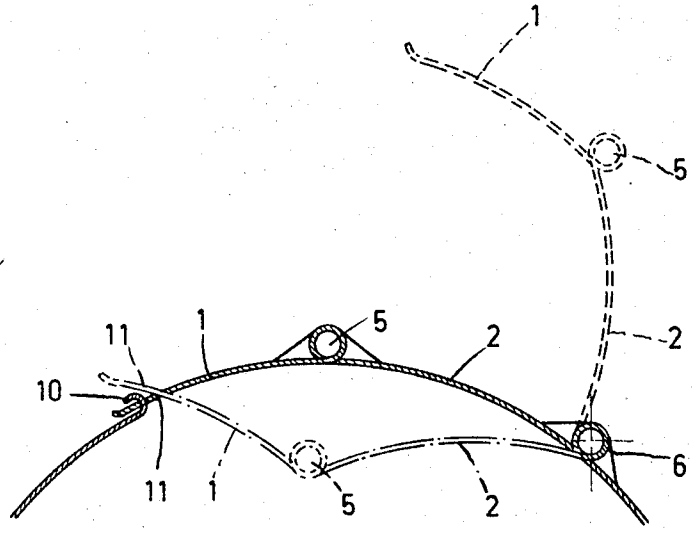
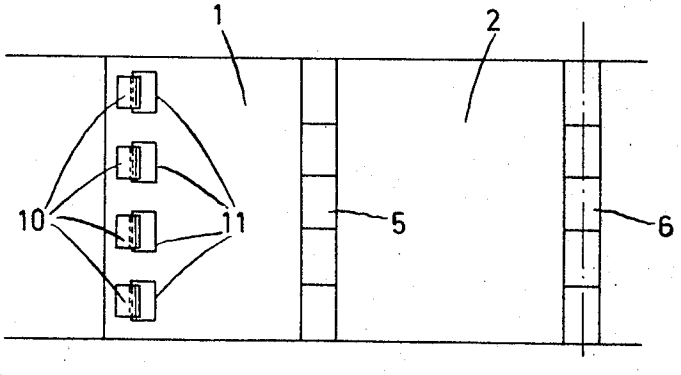


FIG. 6



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Patented July 1, 1969

3,452,803

HINGED SELF-LOCKING CLOSURE DEVICES

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Int. Cl. E05c 7/00
U.S. Cl. 160—213 4 Claims

ABSTRACT OF THE DISCLOSURE

A self-locking closure using a first door hinged on one side of an associated opening and spring biased to swing outward of the opening, and using a second door hinged on an edge of the first door and spring biased to swing inward toward the opening.

The invention relates to hinged self-locking closure devices for containers having an aperture particularly but not exclusively the loading port of a rotatable washing drum of a washing and spin drying machine.

In washing and spin drying machines employing a substantially cylindrical washing drum rotating about a horizontal axis and a loading (or unloading) port in the cylindrical wall a number of difficulties arise in providing a satisfactory closure for the port. When the drum is rotated at high speed for spin drying the centrifugal force on the closure may be very high so that the hoop strength necessary to withstand tensile stresses must also be high. The locking device for the closure must be simple to operate by the user of the machine and be positive in its action.

The object of the invention is to provide a hinged closure device for an aperture in a container, particularly the loading port in the washing drum of a washing and spin drying machine which is self-locking and which substantially overcomes the above mentioned difficulties.

The closure device according to the invention is resiliently urged to pivot about the hinges in one direction to open the aperture. Self-locking and unlocking is obtained by pivotal movement of the closure device in the opposite direction through the aperture. Preferably, the closure device consists of two relatively movable door parts. One of the door parts is hinged to one end of the aperture and the second is hinged to the first door or to the end of the aperture. Self-locking and unlocking is obtained by a lock which in the closed position of the doors locks the doors together or locks said second door to said aperture. The combined lengths of the door parts spanning the aperture is greater than the span of the aperture. The doors are rotated about their hinges so as to overlap when passing through the aperture for the operation of the lock.

With such a construction the width of the doors must be slightly less than the width of the aperture to permit the door to pass therethrough. When a closure device of this kind is applied to the drum of a washing machine intended to be rotated at high speed there is the danger that a part of an article being treated in the drum, for example the corner of a sheet or a handkerchief, may be forced by centrifugal action through the gap between the side of the door and the corresponding side of the aperture with the possibility of damage to the article.

According to a further feature of the invention the side of the closure device bounding the hinged end and the adjacent sides of the aperture are each of sinuate form and interengage when the closure is in the closed position.

Other features of the invention will be apparent from the following description of three embodiments which are given by way of example only with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a part of a washing drum of a washing machine,

FIGURE 2 is an explanatory diagram showing the doors of a modified construction in the open, closed and locking and unlocking positions,

FIGURE 3 is a plan view of the doors of FIGURE 2,

FIGURE 4 is an explanatory diagram showing the doors with an alternative locking device in the open, closed and locking and unlocking positions,

FIGURE 5 is a plan view of the doors of FIGURE 4, and

FIGURE 6 is an alternative construction shown diagrammatically.

Referring now to FIGURE 1 the closure device consists essentially of two door parts **1**, **2** of substantially rectangular form closing a substantially rectangular aperture in the cylindrical wall **3** of a washing drum **4**.

The door **1** is pivotally connected to one end of the aperture by a hinge **5** and the door **2** is similarly connected to the other end of the aperture by hinge **6**. The doors are of arcuate form, forming in the closed position (shown in the drawing) a continuation of the cylindrical wall of the drum. The free edge of each door remote from the hinge is rolled over to form a hook and these hooks are adapted to interchange to form a self-locking device for the doors.

The self-locking and unlocking action will be more clearly understood from FIGURES 2 and 3 which show a modified constructional form, like parts having like references.

The doors **1** and **2** are resiliently urged towards their open position shown in dashed lines in FIGURE 2 by torsion springs **7** surrounding the respective hinged pins. In the closed and locked position of the doors shown in full lines in FIGURE 2 the look-like ends, **8**, **9** respectively of the doors interengage and are maintained in this position by the springs. Any further loading for example by centrifugal force tending to open the doors merely results in an increased tensile force on the hooks.

To open the doors pressure is applied to both doors to rotate them against the action of the springs. As the sides of the doors pass through the aperture the hooks reach a position in which they disengage (as shown in the dash-dot line in FIGURE 2). If then the upper door of the overlapping pair is first released it is urged into its open position and the second door, when released, will also move into its open position. The doors can also be unlocked by pressure applied to the door **2** only since when the doors have reached their locking position of the hooks **8**, **9** the door **1** is moved rapidly to its open position by spring action.

To close and lock the doors they are manually rotated against the action of the springs **7** with the door **1** preferably overlapping the door **2** until the hooks are in a position to interengage. If the movement is not carried far enough for this purpose both doors will fly open when pressure on door **1** is removed. There is thus no danger that the doors may be left in a closed but not securely locked position. If the doors are moved from the open position with the door **2** overlapping the door **1**, self-locking can also be obtained but with slightly greater rotational movement of each door to permit the hook **9** to ride over the end of the hook **8** and by restraining opening movement of the door **1** until the hooks interengage. If such restraint is not applied the door will fly open as the hook **9** clears the hook **8** so that in this case also improper operation is avoided.

An alternative and preferred construction is shown in FIGURES 4 and 5. In this construction the hook and hook engagement is replaced by a hook and eye arrangement. The doors are of pressed stainless steel construction suitably ribbed for greater strength and attached to the door **1** as by rivets are three hooks **10**. The door **2** is provided with corresponding eyes **11** formed by piercing the metal and forming the material defining the hole to provide local stiffness and a shape corresponding to that of the hook on that side of the eye adapted to engage the hook. To cover the apertures presented by the eyes **11** when the doors are in the closed position blanking plates **12** extending beyond each hook may be secured to the door **1** by the same rivets which secure the hooks **10** in position.

The self-locking and unlocking of this arrangement is similar to that described with reference to FIGURES 1, 2 and 3 but greater strength is obtained to withstand the high hoop stress when the doors are employed in conjunction with a high speed centrifuging drum.

A further modification is shown diagrammatically in FIGURE 6. In this arrangement the positions of the hinge and the locking means on the door **1** has been interchanged so that the door **1** is hinged to the door **2** and the free end of the door **1** has eyes **11** adapted to engage hooks **10** secured to the end of the aperture. Both hinges **5** and **6** may carry tension springs, the springs on the hinge **6** being arranged to urge the door **2** into its open position and the springs on the hinge **5** urging the door **1** into the closed position. Inward pressure on the hinge **5** to open the doors causes the doors to pass through the aperture at the same time disengaging the eyes **11** from the hooks **10**. The door **1** may then be manually lifted and both doors permitted to rotate about the hinge **6** to the open position.

In all the constructions above described the doors must pass through the aperture for the purpose of locking and unlocking. It follows that clearance spaces must exist between the sides of the doors and the corresponding sides of the aperture. If these sides are straight then the clearance spaces may be large enough to present a hazard when the constructions are employed on a washing drum intended to be rotated at high speed since centrifugal action may tend to force an article or a portion thereof through the space.

To substantially avoid this difficulty, and as shown in FIGURES 1, 3 and 5, the sides of the doors and the adjacent sides of the aperture are of sinuate form and interengage when the doors are in their closed position. The sinuate edges each have a sufficient number of hills and valleys to hinder the ejection of articles from the drum so that if the corner of an article, such as a handkerchief, starts to pass through the sinuous clearance space the curvature of the edges defining this space causes a partial folding of the material which increases its resistance to passage therethrough.

The sides of the doors and the aperture may be formed to the required shape but preferably the sinuate edges are provided by moulded plastics strips **13**, **14** riveted

or otherwise secured to the doors with corresponding strips **15** secured to the sides of the aperture. Such strips have the additional advantage of having rounded corners so that no sharp edges are presented to the user when the doors are open or to the articles in the drum when the doors are closed.

We claim:

1. A self-locking closure for a container having an aperture, comprising a first door, a first hinge means intermediate an edge of said first door and an edge of said aperture for pivotally mounting said first door to swing through said aperture, a second door, a second hinge means intermediate an edge of said second door and an edge of said aperture, a first resilient means for biasing said first door in a direction outward from said aperture, a second resilient means intermediate said doors for biasing said second door toward said aperture, an edge of said second door opposite said second hinge means overlapping a corresponding edge of said first door, and locking means on said overlapping edges for engaging said overlapping edges in response to inward pressure on said first door.

2. A closure device as claimed in claim **1** wherein said locking means comprises hooks on one of said overlapping edges and corresponding eyes on the other overlapping edge.

3. A closure device as claimed in claim **1** wherein the sides of the doors bounding the hinged ends are serrated, and wherein the corresponding edges of the aperture are serrated.

4. A self-locking closure for a container having an aperture, comprising a first door, a first hinge means intermediate an edge of said first door and an edge of said aperture for pivotally mounting said first door to swing through said aperture, a second door, a second hinge means intermediate an edge of said second door and an edge of said aperture, the edges of said doors and the corresponding edges of said aperture having serrations, a first resilient means for biasing said first door in a direction outward from said aperture, a second resilient means intermediate said doors for biasing said second door toward said aperture, an edge of said second door opposite said second hinge means overlapping a corresponding edge of said first door, hooks on one of said overlapping edges, and corresponding eyes on the other said overlapping edge.

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U.S. Cl. X.R.

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