

Design and Research of Multifunctional Box Device for Packaging Inflammable and Fragile Materials

Lizhen Liu^{1, a}

¹Wenzhou Vocational & Technical College, Wenzhou, 325035, China

^aEmail: 1918427983@qq.com

Abstract

In the existing technology often need to the packing and shipping of flammable breakable, however in the existing technology of flammable breakable packaging is too simple, most simple in packing box package of air cushion or sponge, breakable easily when they are under severe shaking collide with each other and broken, and packing most of existing technology to the one-piece structure, when the packing box combustion occurs, the fire will expand rapidly, it is difficult to control, bring potential safety hazard and damage to property, we put forward a flammable fragile wrapping the multi-function box is used to solve the above problem.

Keywords

Multifunctional packaging; Device; Design; research.

1. BACKGROUND TECHNICAL ANALYSIS

It belongs to the technical field of packing boxes, specifically speaking, it relates to a multifunctional box for packaging inflammable and fragile objects.

The overall name of containers, materials and accessories used to protect products in the process of circulation, facilitate storage and transportation, and promote sales according to certain technical methods; It also refers to the operation of applying certain technical methods in the process of using containers, materials and AIDS for the purpose mentioned above. Marketing packaging focuses on planning strategy, become a broad sense of packaging. You can also dress someone or something up or try to help them be perfect at something.

According to the Chinese national standard GB/ t4122.1-1996, the definition of packaging is : " the general name of containers, materials and auxiliaries adopted in accordance with certain technical methods to protect products, facilitate storage and transportation and promote sales in the process of circulation. "Also refers to the operation of applying certain technical methods in the process of using containers, materials and AIDS for the purpose mentioned above." Other countries or organizations have different expressions and understandings of the meaning of packaging, but the basic meaning is the same, all take the function and function of packaging as its core content, generally has two meanings:

About containers, materials and auxiliary articles for holding goods, namely packing materials;

Technical activities on dressing up, sealing and dressing up, etc.

Design content

For this reason, have to solve is the conventional technology of flammable breakable packaging is too simple, most simple in packing box package of air cushion or sponge, breakable easily when they are under severe shaking collide with each other and broken, and packing

most of existing technology to the one-piece structure, when the packing box when combustion occurs, the fire will rapidly expand, difficult to control, bring potential safety hazard and damage to property of technical problems. The utility model provides a multi-functional box for packaging inflammable and fragile materials. Compared with conventional technology, it can prevent the items in the packaging box from breaking and effectively prevent the occurrence of fire.

In order to solve the above technical problems, the following technical solutions are adopted:

Provides a flammable fragile wrapping the multi-function box, including the box cover, described a removable lid and combination box body's mouth connection, combination described the casing a integrated floor, floor can remove the support plate is placed, as described on the support plate removable equipped with air cushion, air cushion described placed on fire balloon, described the number of combination box into several groups, groups under the above mentioned combination between body stacked way detachable connection, in the above mentioned combination case hinged on the installation have turned the card board, described the rotation of card board have connection card hook end is a integrated, A connecting card groove matching the connecting card hook is embedded in the lower combination box body, and the connecting card hook is stuck in the connection card groove. The inner wall of the combination box body is fixed with a fireproof layer, and the surface of the combination box body is coated with fireproof paint.

As a preferred technical scheme, in a possible implementation, two sets of spring dowels are fixed on both sides of the connecting card slot, and the two sets of spring dowels are detachable connected on both sides of the movable end of the rotating card plate respectively.

As a preferred technical solution, in a possible implementation, the air cushion is fixedly installed with a reinforcing metal ring around the sides, and the bottom plate and the reinforcing metal ring are detachably connected by Velcro.

In a possible embodiment, the supporting plate is embedded with a clamping groove, and the air cushion surface is embedded with a accommodating cavity, and the accommodating cavity is stuck in the clamping groove.

As a preferred technical scheme, in a possible implementation, four fixed columns are arranged on the four sides of the bottom plate surface, and four fixed holes are arranged through the four sides of the support plate, and the four fixed holes are set on four fixed columns respectively.

As an optimal technical scheme, in a possible implementation mode, the fire air bag is fixed with an air valve, and the fire air bag is filled with carbon dioxide gas.

In a possible implementation, the bottom plate splits the interior of the assembly box in two, and the height of the assembly box under the floor is not less than 3cm.

In a possible embodiment, the outer edge of the mouth portion of the combination box body is embedded with an outer embedding groove, and the inner edge of the bottom of the combination box body is embedded with an inner embedding groove.

As a preferred technical scheme, in a possible implementation, the bottom plate is perforated with an air vent.

In a possible embodiment, a magnet is fixed on the bottom plate, and an iron sheet is fixed at the bottom of the support plate, and the iron sheet is detachable connected with the magnet.

As a preferred technical scheme, in a possible embodiment, the number of the combination boxes is 2-4 groups.

As a preferred technical scheme, in a possible implementation mode, the fireproof layer includes paraffin layer, fireproof cloth structural layer and flame-retardant plywood structural layer, and the paraffin layer, fireproof cloth structural layer and flame-retardant plywood

structural layer are fixed and connected to the inner surface of the composite box body from outside to inside.

Compared with existing technologies, this application can obtain the following technical effects:

1) of the flammable fragile objects in this application for wrapping multi-function box body, the top support plate embedded have card into the slot, the surface of the air cushion embedded with seat cavity, and accommodate cavity card into the card into the slot, item card hold cavity in the body, can be very good protection, card into the slot to accommodate cavity have simple fixed effect, prevent the accommodating cavity shaking.

2) the application of flammable fragile wrapping the multi-function box, fixed with valve on fire balloon, and within the fire balloon filled with carbon dioxide gas, air valve for filling the carbon dioxide gas, when a fire, the fire balloon burst, releasing carbon dioxide gas, rapid fire, and fire balloon also protect the goods.

3) the application of flammable fragile wrapping the multi-function box, backplane will combination casing internal split in two, and in combination of floor at the bottom of the box body height not less than 3 cm, body composition, floor space below items can be combined to the bottom of the enclosure to provide allocation of space, in a combination of the bottom of the box body through the floor beneath the setting of the space, can keep at a distance of more than 3 cm, with the ground to have the moistureproof and heat effect.

4) the application of flammable brittle material packing multi-function box body, the items in the box body layer, combination box body can be removed, convenient later when using the theft, and the box body internal split into separate space, the fire can be isolated, it is combination of box internal fixation with fire protection layer, and the combination of box surface coated with fireproof paint, effectively prevent the fire.

Of course, the implementation of any product of this application does not necessarily require all of the technical effects described above to be achieved simultaneously.

2. ATTACHED DRAWINGS

The drawings illustrated herein provide further understanding of the application and form part of the application. Schematic embodiments of the application and their descriptions are used to interpret the application and do not constitute an improper qualification of the application. In the attached picture. See figure 1-5.

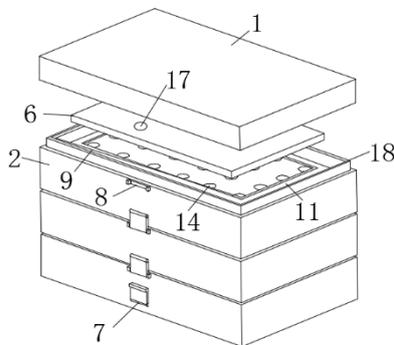


Fig 1. is a structural schematic diagram of a multifunctional box for packaging of inflammable and fragile materials in this application embodiment.

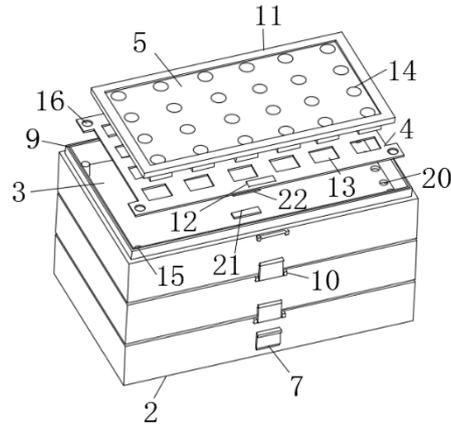


Fig 2. Is a three-dimensional structure diagram of the uninstalled lid of a multi-functional box body for packaging of inflammable and fragile materials in this application embodiment

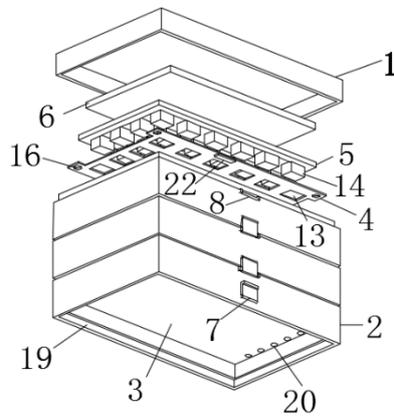


Fig 3. Is an upward three-dimensional schematic diagram of a multifunctional box for packaging of inflammable and fragile materials in this application embodiment

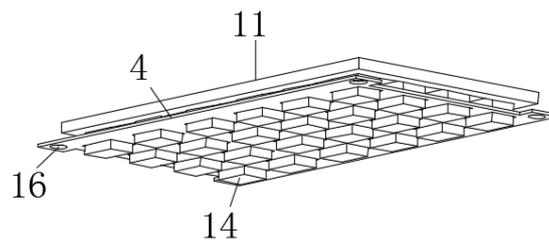


Fig 4. Is a schematic diagram of the connection between the support plate and the air cushion of a multi-functional box body for packaging of inflammable and fragile materials in this application embodiment.

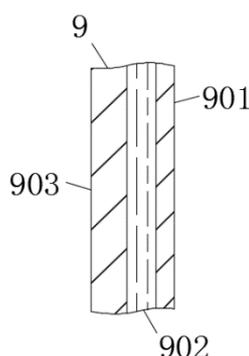


Fig 5. Is a schematic diagram of fire prevention layer of a multifunctional box for packaging of inflammable and fragile materials in this application embodiment.

Diagram: 1 box lid, 2 combination box, 3 floor, 4 support plate, 5 air cushion, fire balloon 6, 7 rotation card board, 8 connection card slot, 9 902, 901 paraffin wax layer, fire prevention floor fireproof fabric structure layer, the structure of the 903 fire retardant plywood, 10 spring pin, and strengthen the metal ring, 12 Velcro, 13 card into the slot, fixed pillars hold cavity 14 and 15, 16 fixed perforation, 17 valve, 18 embedded trough, 19 embedded within the tank, 20 air holes, 21, 22 iron magnet.

3. TECHNICAL RESEARCH

Box cover and a detachable connection combination box body's mouth, as described in the casing one molding floor, floor can remove the support plate is placed, the application of a flammable brittle material packing support plate used to support a mattress multi-function enclosure, need to take out the combination of the casing, can be directly set out support plate, support plate on the removable equipped with air cushion, items placed within the air cushion, can effectively reduce the goods transported by vibration, air cushion placed on fire balloon, fire balloon during a fire can have the effect of fire extinguishing, enclosure for the composite enclosure structure, contents of the box body layer, The combination box can be disassembled for convenience in later use, and the inside of the box is divided into separate Spaces, which can be isolated in case of fire. The inner wall of the combination box is fixed with fire prevention layer, and the surface of the combination box is coated with fireproof paint, which can effectively prevent fire.

1) a flammable fragile wrapping the multi-function box, including the lid (1), its characteristics is described in the lid (1) (2) the combination body mouth detachable connection, combination described within the body (2) a integrated with base plate (3), on the floor (3) can remove the place has a support plate (4), described in the supporting plate (4) (5) removable equipped with air cushion, air cushion described (5) placed on a fire balloon (6), described combination box body (2) into several groups, the number of groups under the above mentioned combination between body (2) stack detachable connection, In the above mentioned combination box body (2) on the articulated installation have turned the card board (7), described the rotation card board (7) have connection card hook end is a integrated, stated at the bottom of the composite box body (2) embedded with cooperate with clamp hook on the connection of the card slot (8), and the connection card hook into the connection in the card slot (8), described combination box body (2) the internal fixation with fire protection layer (9), and combination box body (2) the surface coated with fireproof paint.

2) a multi-functional box body for packaging inflammable and fragile objects as described in claim 1, which is characterized by that two sets of spring pins (10) are fixed on both sides of the connecting card slot (8), and the two sides of the movable end of the rotating card plate (7) are detachable connected with two sets of spring pins (10) respectively.

3) a multi-functional box body for packaging inflammable and fragile objects mentioned in claim 1, which is characterized by that the air cushion (5) is fixed with a reinforcing metal ring (11), and the bottom plate (3) and the reinforcing metal ring (11) are detachable connected by Velcro (12).

4) a multi-functional box body for packaging of inflammable and fragile objects mentioned in claim 1, which is characterized by that the supporting plate (4) is embedded with a clamping groove (13), and the air cushion (5) surface is embedded with an accommodating cavity (14), and the accommodating cavity (14) is stuck in the clamping groove (13).

5) as right request 1 stated a flammable brittle material packing multi-function box body, its characteristics is described around the fixed on the surface of the floor (3) is equipped with four pillars fixed (15), described the sides of the support plate (4) through (16), is equipped with four fixed perforation and four fixed perforation (16) respectively set on the four pillars of fixed (15).

6) a multi-functional box for packaging inflammable and fragile objects as described in claim 1, whose characteristics lie in that the fire air bag (6) is fixed with an air valve (17), and the fire air bag (6) is filled with carbon dioxide gas.

7) a multifunctional box body for packaging of inflammable and fragile materials mentioned in claim 1 is characterized by that the bottom plate (3) divides the inside of the combination box (2) in two and the height of the combination box (2) under the bottom plate (3) is no less than 3cm.

8) a multifunctional box body for packaging of inflammable and fragile objects mentioned in claim 1 is characterized by that the outer edge of the mouth of the combination box body (2) is embedded with an external embedding groove (18), and the inner edge of the bottom of the combination box body (2) is embedded with an internal embedding groove (19).

9) a multifunctional box body for packaging of inflammable and fragile materials, as mentioned in claim 1, is characterized by a perforating air hole (20) through the bottom plate (3).

10) a multi-functional box body for packaging inflammable and fragile objects mentioned in claim 1, which is characterized by that a magnet (21) is fixed on the bottom plate (3), and an iron sheet (22) is fixed on the bottom of the support plate (4), and the iron sheet (22) can be detachable connected with the magnet (21).

11) as a kind of multifunctional box for packaging of inflammable and fragile goods mentioned in claim 1, its feature is that the number of the combination box (2) is 2-4 groups.

12) as right request 1 stated a flammable brittle material packing multi-functional box body, its characteristics is described in the fire protection layer (9) including paraffin (901), the structure of the fire prevention cloth (02) and flame retardant plywood structure layer (903), and paraffin wax layer (901), the structure of the fire prevention cloth layer (902), and flame retardant plywood structure from inner to outer in an (903) in accordance with the fixed connection at the inner surface of the body (2).

4. SPECIFIC IMPLEMENTATION METHODS

The implementation of this application is described in detail in the following drawings and embodiments so as to fully understand and implement the process of applying technical means to solve technical problems and achieve technical efficacy.

As shown in figure 1-5, provides a flammable fragile wrapping the multi-function box, including the box cover 1, lid and combination box 1 2 mouth detachable connection, combination box in a integrated floor 3, 2 floor 3 removable support plate is placed on 4, support plate used to support a mattress to 5, 4 combination can be removed the items in the box body 2, can be directly set out support four plate, support plate 4 removable equipped with air cushion, 5 items put inside cushion 5, can effectively reduce the goods transported by vibration, air cushion is placed on 5 fire balloon 6, fire balloon 6 during a fire can have the effect of fire, Combination box 2 into several groups, the number of combination box body 2 for 2-4 group, the number of a number of combined group box above removable stacked way under the connection between 2, in the combination of the above case hinged on 2 installed have turned the card board, turn the card board 7 have connection card hook end is a integrated, embedded in combination box below 2 sets with clamp hook with the connection of the card slot, 8, and connection card hook card connection card slot in the 8, enclosure for the composite enclosure structure, contents of the box body layer, combination box 2 can be removed, convenient take later when using, and the box body internal split into separate space, In case of fire, it can be isolated. Fire prevention layer 9 is fixed on the inner wall of the combination box 2, and the surface of the combination box 2 is coated with fireproof paint to effectively prevent fire.

Optional, connecting both sides of the card slot 8 fixed is equipped with two sets of the spring pin 10, turn the card board 7 activity on both sides of the 10 removable separately with two sets of spring pin connection, turn the fixed end of card board 7 can be installed torsional spring, rotate card board 7 link card hook card into the card slot 8, facilitate the combination of connection between composite box 2, through the spring pin 10 Settings, play the role of insurance. Prevent connection hook from disconnecting from connection card slot 8.

Optionally, reinforced metal ring 11 is fixed around the air cushion 5. The bottom plate 3 and reinforced metal ring 11 are detachable through Velcro 12. The metal reinforced ring 11 plays the role of reinforcing the air cushion 5 to facilitate the fetching of air cushion 5.

Optional, support plate on the 4 inserts a card into the slot 13, 5 surface air cushion embedded has hold cavity is 14, and accommodate 14 CARDS into the cavity inside the card into the slot 13 items card within the accommodating cavity is 14, can be very good protection, card into the slot 13 to accommodate cavity 14 simple fixed effect, prevent the accommodating cavity 14 shaking.

Optionally, four fixed pillars 15 are fixed on the four sides of the surface of the bottom plate 3, and four fixed holes 16 are fixed through the four sides of the support plate 4, and four fixed holes 16 are respectively set on the four fixed pillars 15. The area of the support plate 4 is smaller than that of the bottom plate 3 for easy access.

Optionally, there is an air valve 17 fixed on fire bag 6, and the air bag 6 is filled with carbon dioxide gas. The air valve 17 is used to fill with carbon dioxide gas. When a fire occurs, the fire bag 6 ruptured, releasing carbon dioxide gas and quickly extinguishing the fire.

Optional, floor 3 will combination box 2 internal split in two, and at the height of the bottom 3 combination box below 2 not less than 3 cm, body composition, floor 3 at the bottom of the space can be combined to the bottom of the contents of the box body 2 provide accommodate space, in combination of the bottom of the body through the floor 2 3 below the setting of the space, can keep at a distance of more than 3 cm, with the ground to have the moistureproof and heat effect.

Optionally, the outer edge of the 2 mouths of the combination box body is embedded with an external embedding groove 18, and the inner edge of the bottom of the combination box body 2 is embedded with an internal embedding groove 19. The combination box body 2 is interlocked through the setting of the external embedding groove 18 and the internal embedding groove 19 to enhance the connection strength.

Optionally, there is an air vent 20 through the bottom plate 3, which can relieve pressure in case of fire and prevent explosion in the combination box 2 due to high pressure.

Optionally, magnet 21 is fixed on the bottom plate 3, and iron sheet 22 is fixed on the bottom of support plate 4, and the iron sheet 22 is detachable and connected with magnet 21. The setting of magnet 21 and iron sheet 22 facilitates the connection between the bottom plate 3 and support sheet 4.

Optional, fireproof layer 9 including paraffin 901 02 and flame retardant plywood, fireproof fabric layer structure layer, 903, 901 and paraffin wax layer, the structure of the fire prevention cloth layer 902 and flame retardant plywood structure from inner to outer in an 903 according to the fixed connection on the inner surface of the composite box 2, 9 through the protective layer Settings, can reduce the loss caused by the fire, to prevent the fire spreading.

Concrete work, the application of a flammable brittle material packing multi-function box support plate 4 being used to support a mattress to 5, need to take out the combination of the items in the box body 2, can be directly set out support four plate, support plate 4 removable equipped with air cushion, 5 items put inside cushion 5, can effectively reduce the goods transported by vibration, air cushion is placed on 5 fire balloon 6, fire balloon 6 during a fire can have the effect of fire extinguishing, enclosure for the composite enclosure structure, contents of the box body layer, combination box 2 can be removed, convenient take later when using, and the box body internal split into separate space, Fire can be isolated, it is combination box 2 internal fixation with fire protection layer of 9, and the surface of the composite box 2 coated with fireproof paint, effectively prevent the fire box body after combination, floor 3 at the bottom of the space can be combined to the bottom of the contents of the box body 2 provide accommodate space, in combination of the bottom of the body through the floor 2 3 below the setting of the space, can keep at a distance of more than 3 cm, with the ground to have the moistureproof and heat effect.

For example, in the specification and claims, certain terms are used to refer to specific components. Technicians in the field should understand that hardware manufacturers may use different terms for the same components. This specification and claim are not distinguished by the difference of names, but by the difference of functions of components. If "include" mentioned in the whole specification and claim is an open term, it should be interpreted as "include but not limited". "Roughly" means that within the acceptable error range, the technical personnel in the field can solve the technical problems within a certain error range and basically achieve the technical results. Furthermore, the term "coupling" here includes any direct and indirect means of electrical coupling. Therefore, if a first device is coupled to a second device, it means that the first device can be directly electrically coupled to the second device, or indirectly electrically coupled to the second device through other devices or coupling means. The specification is subsequently described as a better way of implementing the application. However, the description is intended to explain the general principles of the application and is not intended to limit the scope of the application. The scope of protection in this application shall be as defined in the attached claims.

Also to be sure, the term "including" and "include" or any of its other variants is intended to cover a non-exclusive contain, which includes a series of elements of a commodity or system include not only those elements, but also no clear list of other elements, or also include inherent elements for this kind of commodities or system. Without further restriction, the sentence "include a..." "The limited elements do not preclude the existence of another identical element in the commodity or system containing the said elements.

5. CONCLUSION

It should not be seen as an exclusion from other embodiments, but can be used in a variety of other combinations, modifications and contexts, and can be modified, within the scope of the ideas presented herein, by means of the above teachings or by technology or knowledge in the relevant fields. The spirit and scope of the changes and changes made by personnel in the field shall be within the protection of the attached claims.

REFERENCES

- [1] Nazife Karamullaoglu, Ozlem Sandikci. A sociohistorical analysis of packaging design: a case study of the Turkish pasta brand Piyale [J]. *Journal of Historical Research in Marketing*, 2019, 11(3).
- [2] Hui Zhao, Yuxuan Qi, Charles Spence, Xiaoang Wan. On the costs and benefits of using triangles in packaging design [J]. *Food Quality and Preference*, 2019, 78.
- [3] Nadeesha M. Gunaratne, Sigfredo Fuentes, Thejani M. Gunaratne, Damir Dennis Torrico, Caroline Francis, Hollis Ashman, Claudia Gonzalez Viejo, Frank R. Dunshea. Effects of packaging design on sensory liking and willingness to purchase: A study using novel chocolate packaging [J]. *Heliyon*, 2019, 5(6).
- [4] Wentao Wu, Paul Cronjé, Pieter Verboven, Thijs Defraeye. Unveiling how ventilated packaging design and cold chain scenarios affect the cooling kinetics and fruit quality for each single citrus fruit in an entire pallet [J]. *Food Packaging and Shelf Life*, 2019, 21.
- [5] Deepshikha Datta, Sumit Mahto, Nitin Kumar, Gopinath Halder. Parametric optimization and kinetic elucidation of degradation of starch blended LDPE films through central composite design approach towards application in packaging [J]. *Process Safety and Environmental Protection*, 2019.
- [6] Biotechnology - Biopolymers; Study Findings on Biopolymers Are Outlined in Reports from Stefan cel Mare University Suceava (Use of Biopolymers In Designing Edible Packaging Materials for Food Industry Development of Statistical Models) [J]. *Food Weekly News*, 2019.
- [7] Chemistry; Study Data from University of Paris Saclay Provide New Insights into Chemistry (Rational Design of Packaging: Toward Safer and Ecodesigned Food Packaging Systems) [J]. *Food Weekly News*, 2019.
- [8] Andy Patrizio. Intel unveils new 3D chip packaging design [J]. *Network World (Online)*, 2019.
- [9] Anonymous. FPA 2020 STUDENT FLEXIBLE PACKAGING DESIGN CHALLENGE [J]. *Flexible Packaging*, 2019, 22(7).