

CAD Design of CJX2-150 Contactor Packaging Box

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Keywords: CAD structural design; corrugated paper box; packaging box design; contactor

Abstract. This article designed the packaging box of CJX2-150 contactor through observing the size, shape, weight and test the property of the contactor, briefly introduced the procedures from design to modeling of the packaging box. The idea of the packaging design, the components of packaging, and the notes and rules we should pay attention while designing the packing can also be found in this thesis to offer a direct cognition for others.

1. The Design Process of Corrugated Paper Box

1.1 Design Analysis

First, when we get a product, the product analysis according to the testing and analysis of its size, weight, shape and the purpose should be done before we started to design. We should know whether there is analogous product packaging have ever appeared so that we can innovate and improve the product packaging through the shortcomings we got from the feedback of survey and the requests of the customers.

1.2 The Design and Manufacturing Process of Packaging Box.

1.2.1 The Testing of Physical Property and the Selection of Material of the Product.

First, the size and weight of the contactor should be tested according to the contactor showed in Diagram 1. It is showed in Table 1.

Table 1 CJX2-150 Contactor

Product	Shell	Shape	Size	Weight	Density
CJX2-150 Contactor	Plastic	Cuboid	155x121x131 (cm)	2.07kg	8.6x10



Diagram 1 CJX2-150 Contactor

Appropriate corrugated board should be chosen to make the packaging box according to the weight of the product. For example, seven-layered, five-layered, and three-layered respectively are BCC, EBC, BC, BE, single C, single B and single E tiles. The parameter of corrugated boards is showed in Table 2.

Table 2. The Parameter of Corrugated Boards

Classification of Corrugated Board	BCC	EBC	BC	BE	Single C	Single B	Single E
Thickness (mm)	11	9	7	5	4	3	2

The size of the product itself is generally called inside dimension. To consider of the thickness of the corrugated board, a little bit interspace should be added when the inside dimension is translated into manufacturing dimension while the packaging box being designed. The lengthen and the width of the interspace should be +3~4mm, the height of the interspace should be +2~3mm.

Preliminary identification aimed at the product should be made after the selection of corrugated board. The key points of the product that needed to be protected should be collated. It is showed in Diagram 2.

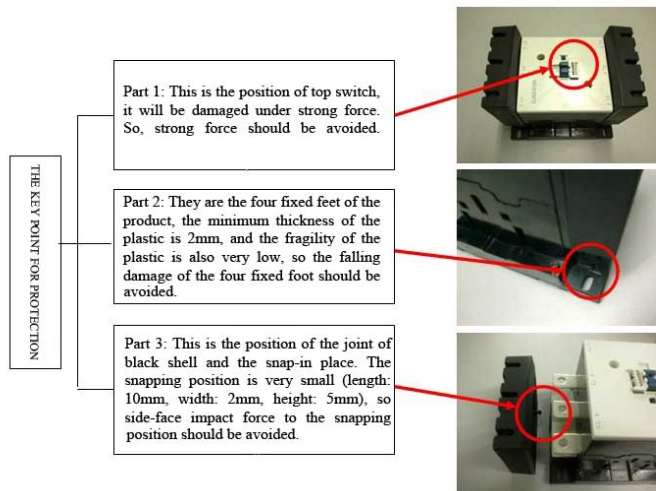


Diagram 2 The main points of protection.

1.2.2 CAD Drawing

Structural chart can be drawn through CAD software after the selecting of material. The size should be calculated while drawing, the corrugated board should be single B. There are differences between corrugated boards in different companies, the thickness of each corrugated board is also different.

There are many kinds of corrugated cases, but there is only one manufacturing dimension in the process of design. Corrugated board is different from other ordinary paper box because it has its own thickness. The manufacturing dimension is related to the thickness of corrugated board, so the dimensions of paper boxes with various structures can be ascertained only if the relationship of the length, width, height and the thickness of the paper box are well mastered.

There are three dimensions of corrugated cases: inside dimension, manufacturing dimension and outer dimension. Inside dimension is the dimension of the product, manufacturing dimension is the designed dimension, and outer dimension is the dimension of the paper boxes we made.

There should be corresponding computer mode to calculate inside dimension, manufacturing dimension and outer dimension. We can get the dimension we need, as well as the swing cover.

But the accuracy of carton box manufacturing is not very high, so most companies add or minus a correction factor on inside dimension or outer dimension directly to collate the inside dimension, manufacturing dimension and outer dimension of 0201 cube type. The new comers don't need to calculate the dimensions by themselves, they can only add or minus the parameters according to the table.

The convention from inside dimension to manufacturing dimension of corrugated board single B is: tied tongue 30mm; length +3mm; width 1' +3mm; height +6mm; Width: 2' +2mm.

the same parameter should be added to length and width 1, because length and width both should be folded twice at one side, but height should not only be folded twice, there is a layer of corrugated

board at the bottom of the corrugated case, so height should be added the parameter of the thickness of corrugated board. The parameter added to width 2 should be less than the parameter added to length and width 1, because width 2 should only be folded once, but it should be nailed or glued with the tied tongue.

We can start to design the packaging box after we know the dimensions needed to be noticed of corrugated board single B. Run CAD software, create a coverage, set white tangent line, green indentation layer, blue label, then draw the diagram. Overall framework should be designed firstly and keep it is unchanged, other factors can be changed. It is showed in Diagram 3.



Diagram 3 Framework 1

Bottom locked structure is used in the design of packaging box, the main advantage of bottom locked structure is the assembling is simple, the box can be shaped up without nailing or gluing. It is showed in Diagram 4.

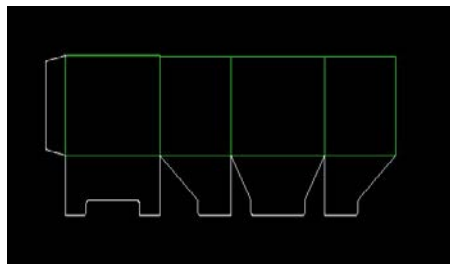


Diagram 4 Framework 2

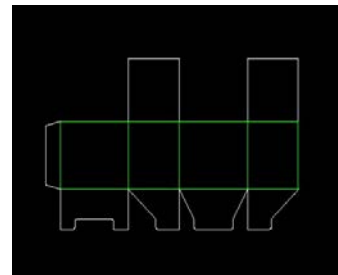


Diagram 5 Framework 3

To protect the easily damaged parts, the swing cover has been transformed. The swing cover fold downward to bear the pressure impact from the two flanks. It is showed in Diagram 5.

Then, interlocked cover can be designed to seal up the product in case of the product drop out of the box. It is showed in Diagram 6.

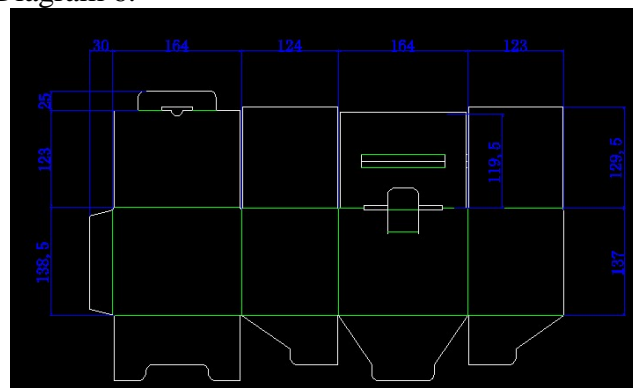


Diagram 6 Framework 4

Gaskets are used in the protection of front and back. Sometimes, there are too many places should be protected, the transformation of the paper box cannot match the purpose of product protection, some small spare parts such as gaskets, clapboards, scaled boards, angle beads and edge beads with various shapes can be made of corrugated boards to protect the production.

The grating, gaskets, etc. in corrugated cases are all very important. Some products have complicated outlines, various shapes can be made by hydraulic machine if cystosepiment is used.

But because corrugated boards having the shape of a real square, we cannot design whatever shapes we need, so gratings and gaskets can be designed for the complicated parts of product to protect the complicated parts. It is showed in Diagram 7.

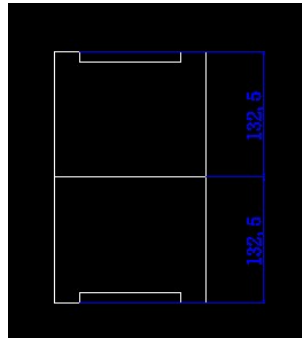


Diagram 7 Gaskets

1.2.3 To Make a Proof with Proofing Press

Appropriate corrugated board (without any damages and severe bending) should be selected and put on proofing press. Make sure the testing board is in the right position, import the drawing to the panel, combine the drawing with pressing the shortcut key ctrl+J, run the operation panel with pressing the shortcut key F5. Back to the original point, adjust the position of diffusion knife and pinch roller with pressing the keys of UDLR. Set the original point at the appropriate position, test the scope and begin to make the proof in vacuum.

1.2.4 The Inspection of Corrugated Case Proof

Bind the proof with nails or glue, combine it and put the proof into inspection to test its crushing resistance and shock strength, if the proof is not match the orders, modifications according to the test should be made until the proof pass the inspection. If necessary, the drawing can be inspected with printer.

2. The Added Value of Package

2.1 The Value of Packaging

Product program is showed in Diagram 8, it is formed with a main packaging box and two gaskets. The easily damaged parts around the box are exactly protected. The packaging box not only protects the product but looks very concise and fancy from the overall packaging.

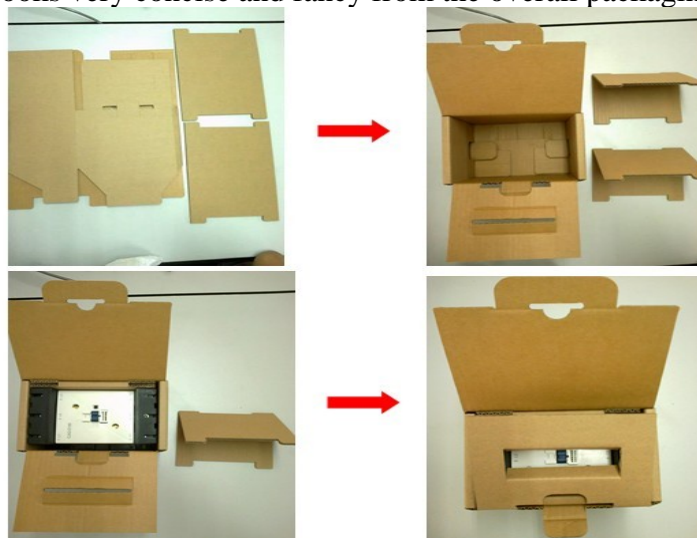


Diagram 8 Assembling Process

2.2 The Introduction of Packaging

As a structure designer, you need not only design the packaging box for the product, but also introduce the idea and value of your design.

The production need to be approved by the customers, but a lot of the customers cannot understand the advantages of our design, so you should introduce the advantages and disadvantages of your production with your professional knowledge to make the customers understand what kind of advantages they can get if they choose your design. It is showed in Diagram 9.

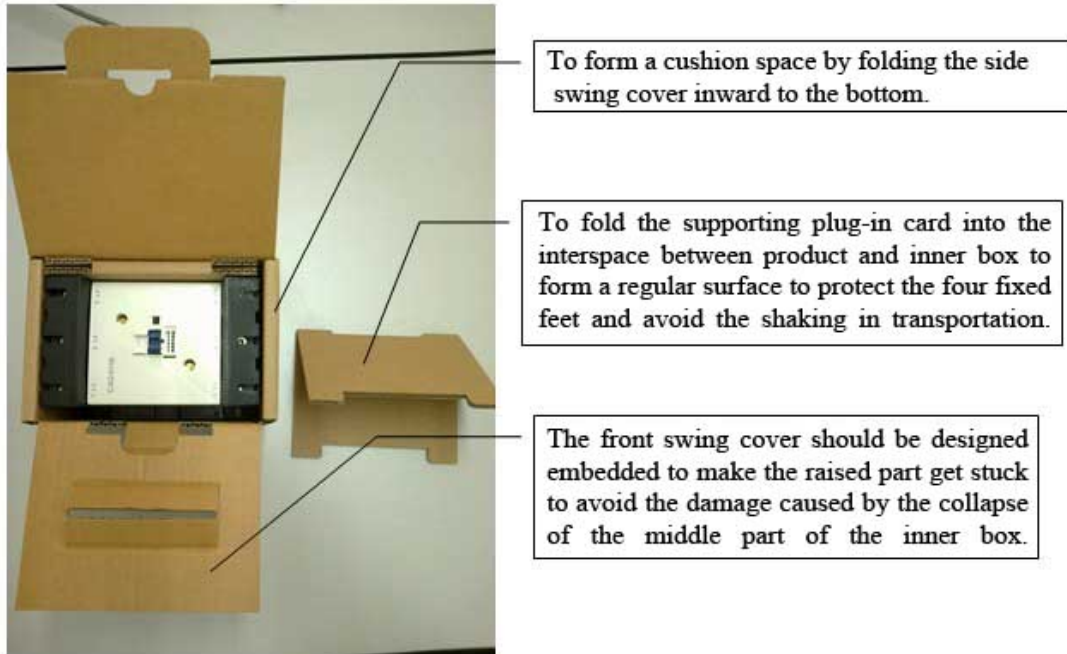


Diagram 9 Overall packaging design sketch

3. The Process of Volume Production

The well designed drawing can be put into production after the inspection. The general production of corrugated cases including the following processes: pre-printing, printing and post-press finishing.

3.1 Pre-Printing

Get the drawing, make the die-board according to the requests of the drawing (slotting and blunt version). Slotting: Make corresponding grooves after material is ready, branching and indenting. Blunt version: Get the shape, dimension and the component technique through equipment. To compare with blunt version, slotting makes the best value of money.

3.2 Printing

Printing is the technique that through plate making, ink putting, and forcing to make the original manuscript such words, drawing and pictures, then transfer printing ink to the surface of paper, texture, leather and other material and copy the contents of original manuscript in big batch. The 3 common corrugated board printing are: flexographic printing, offset printing and screen printing.

Flexographic printing is mainly used in companies. Because water based printing ink is used, some people also call it water mark.

The features of flexographic printing used in corrugated board printing.

1) Big printing breadth. The maximum printing breadth of general width flexographic plate printer can be 2.5-2.8m.

2) Low cost. The pressrun of flexographic plate printer is high and can be reused.

3) Systematic production. Eg: The processes of printing, slotting, indentation, nailing or gluing, bounding can be unitedly completed.

4) The strength reduction of corrugated board is not high and flexographic printing is low-pressure printing, so the influence to the strength of corrugated board is also not big.

5) Some platemaking are difficult, some are easy. The platemaking of words is relatively easy, but the plate making of four-colored diagram is relatively difficult.

6) The stability of presswork is not good. It can be seen on the aspect of the difficult controlling of the color of printing ink.

3.3 Post-press Finishing

The most common post-press finishing are film-adding, concave-convex impression, oil-polishing, gilding, silvering and flocking. There are MATT light and brilliant light in film-adding and oil polishing.

3.4 Delivering

The volume-produced packaging paper box should be transported to Logistics Department. Logistics Department will arrange delivery vehicles to deliver the goods to the customers, then tasks are concluded.

4. Epilogue

Although we cannot judge people with their appearance, good appearance is always leave deep impression for others, so is the packaging. A clean and concise box is far more welcomed than a sluttish box, it also looks more fancy. Except for the function of protecting products, packaging box can also promote the price of the product, just like the moon cakes sold in supermarkets, the price can be doubled or more just because the change of its packaging.

Fund program

Zhejiang higher vocational colleges young and middle-aged professional leaders' professional leading project (1j2013043); 2011 Zhejiang planning project on educational technology research (JB078).

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