Research and Application of "Rhythm and Rhyme" in the Modelling Design on Agricultural Machinery Product

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Abstract. Nature gives rhythm and rhythm to farmland and crops. Then, as agricultural machinery products serving agriculture, its modelling design should also adapt to the nature of nature, fully embodies the "rhythm and rhyme" aesthetic feeling, harmonious in nature. In the modelling design of agricultural machinery products, rhythm and rhyme are often used to obtain the aesthetic feeling of machine modelling. Due to the structure and function of agricultural products, design often emphasizes the rhythm and rhyme of the repeated side.

1. Introduction
The universe is running in an orderly manner, the human body is moving in a regular way, and everything in the world is moving in a rhythmic and balanced way. Here there is a kind of because of regular, repeated or organized order changes and inspire people's aesthetic feeling, this is the rhythm and rhyme.
Rhythm is a term borrowed from music. Music is the art of "time". In music, rhythm is the order of the times in which sounds of varying duration and intensity pass. In product modelling without time element, rhythm is generally regarded as a kind of rhythm form with order sense, which is rational, repetitive and continuous.
Rhyme is a term borrowed from poetry. In moulding arts, rhythm refers to the rhythm in the performance like poetry cadence of the beautiful emotional appeal. Rhythm is the basis of rhyme, rhyme is the deepening of the connotation of rhythm, is to pour rhythm in the artistic content to emotional factors, rhyme beauty is a regular repetition, organized changes in the form of beauty.
Swarthy fields, green wheat seedlings in the wind waves, heavy grain golden rice... Nature gives farmland and crops the beauty of rhythm and rhyme. Then, as agricultural machinery products serving agriculture, its modelling design should also adapt to the nature of nature, fully embodies the "rhythm and rhyme" aesthetic feeling, harmonious in nature.

2. Form of Rhythm
Rhythm is an important means of integrating clutter into one. The most important feature of rhythm is to form components and the repetition of the spacing between these components. The repetition of the rhythm may be uniform, reduced or increased. There are two main types of repetition: static repetition and dynamic repetition. A static repetition of rhythm is a repetition of the same form at the same interval. The dynamic repetition of rhythm is based on arithmetic or geometric progression. The former, the law is that any two adjacent interval is not equal, according to the arithmetic progression change. The latter, whose rule is that the length of the latter interval is equal to the length of the preceding interval multiplied by a constant. The specific content of the rhythm form is as follows:
The corresponding figure is shown in Figure 1.

Simple repetitive rhythm

Complex repetitive rhythm

Alternate sections of that same form in the same interval

Alternate rhythms of the same form in different intervals

Alternate rhythms of different forms in different intervals

Arithmetic series interval rhythm

Geometric series interval rhythms

Figure 1. Form of rhythm.
3. Form of Rhyme
The formal features of rhyme are as follows: repetition of expression forms, equally spaced and overlapping of priorities. There are many forms of rhyme, such as continuous rhyme, gradual rhyme and undulatory rhyme.

Continuous rhyme: a rhythm produced by the repeated arrangement of one or more basic figures. Such as roller chains and tracks, as shown in figs. 2 and 3.

Figure 2. Continuous rhythm of roller chain.  
Figure 3. Continuous rhythm of tracks.

Gradual rhyme: a rhyme produced by the addition or subtraction of a repeating part in one way or another. Such as a ventilation hole of walking tractor casing etc., as shown in fig. 4.

Figure 4. Gradual rhyme of a ventilation hole.

Undulatory rhyme: a rhyme produced by the regular increase or decrease of components. Such as multi-belt triangular belts and the like, as shown in fig. 5.

Figure 5. Undulatory rhyme produced by multi-belt triangular belts.

These three rhymes, although their forms of expression are different, their common characteristics are repetition and change. Repetition is the necessary condition to obtain rhyme, without repetition can't produce rhyme, but only repeated without regular changes, feel boring and monotonous.

4. Application of Rhythm and Rhyme in Modeling Design of Agricultural Machinery Products
In the modeling design of agricultural machinery products, rhythm and rhyme are often used to obtain the aesthetic feeling of machine modeling. Due to the structure and function of agricultural products, design often emphasizes the rhythm and rhyme of the repeated side.

In farming machines, many machines consist of a series of identical components. Such as disk harrow, intertillage shovel, plows, planters, nail teeth, plow bodies, etc. Fig. 6 is a disk harrow and Fig. 7 is a suspended plow, which the disks and plows regularly and continuously arranged through the frame to create a continuous rhythmic aesthetic. Fig. 8 shows an intertillage shovel, which tips staggered back and forth through the frame to create a more rhythmic undulating rhythmic aesthetic.

Figure 6. Continuous rhyme produced by disc harrow.  
Figure 7. Continuous rhythm produced by a suspended plow.

Figure 8. Undulatory rhyme produced by the intertillage shovel.
In tractor modeling design, such as the key points of whole machine, hood, front face and other also often use rhythm and rhyme. Single use of a rhythm pattern is easy to produce monotonous, boring feeling, so often use two different rhyme composition, in order to achieve the effect of seeking change in unity. Fig. 9 shows the front face of the tractor, which a rectangular continuous repeating pattern applied to the lower part and the upper part is a ventilation window with transverse horizontal lines. The two patterns form a contrast, a thin a dense, a large a small, make the front face has a complete unity and not drab inflexible modelling image. Fig. 10 is a front elevational view of that track tractor and Fig.11 is a front elevational view of the tire tractor, which have a contoured convex-shaped rhyme. Fig. 12 shows the shape of the rear wheel tire of the tractor, which annular arrangement of patterns, produce continuous dynamic, more highlighted the tractor forward power.

In addition, the processing machinery also has the rhythm and the rhyme technique application. Fig. 13 is a side view of a small thresher with two ventilation windows using two different continuous rhyme patterns. Because of the contrast of the linear direction, make the modelling more vivid.

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