

Construction Plastering Lift Machine

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Abstract: *The plastering machine can effectively improve the plastering efficiency, and the plastering process mainly includes filling the mortar, plastering, floating mortar, and compacting mortar. All of these function is completed by a plastering device. The diversity and complexity of the device increase the production cost and the weight of the whole machine. In order to guarantee the plastering quality and optimize the institution, this thesis designs a plastering device that integrates mortar supply, plastering, surface flattening, and compacting functions. The working process of the plastering mechanism includes upward plastering and downward flattening, mainly achieved by the rotation motion of the hopper. The contour shape of the hopper was designed using the principle of cam mechanism, and the upward plastering and self-locking of the hopper after reaching the top were designed using the principle of connecting rod mechanism. The hopper is supported by two pneumatic springs. The flipping force of the pneumatic springs during the upward plastering and downward plastering processes was analyzed and calculated, which provides the basis for choosing the power of the driving motor.*

Keywords: *plastering machine*

I. INTRODUCTION

During the construction process, the decoration project will occupy 2/3 of the total construction period and 35% of the total labor force respectively. The plastering project will be generally finished by manual work, which occupies 15~26% of the total labor force. The problem brought by this is occupying too many labor forces, low working efficiency, and long construction period, which will affect the completion rate of the project. The appearance of the plastering machine can effectively improve the plastering efficiency [1]. At present, the plastering machine can be divided into two kinds: spraying plastering machine and automatic plastering machine [2, 3]. The spraying plastering machine delivers the mortar through spraying by the delivery pump. But the compaction and floating process was also finished by manual work. The automatic plastering machine can finish the functions of mortar supply, floating, compaction, and conversion in one time [4, 5]. The function, including filling the mortar, plastering, floating, and compaction structure, is completed by a plastering device. The plastering device is the key for the automatic plastering machine to realize the plastering. The existing plastering devices are respectively finished by many institutions [6, 7]. For example, mortar should be forcefully supplied to the wall space. Mortar supply can adopt gravitational transportation, auger delivery, link joint delivery, and so on [8, 9]. Floating can be straight-line floating, curve floating, or floating of circling motion. The compaction strength can be realized by setting and adjusting the elastic link or vibrating motor on the plastering machine

Design of plastering device

Analysis of the working condition of the plastering device

The plastering device is moved along the upright tube by the driving device. The upward process can fulfill plastering. The downward process can fulfill flattening mortar. The hopper is responsible for filling the mortar. The plastering plate is responsible for plastering the wall. The mortar layer is formed by the lower edge of the plastering plate. As shown by Figure 1(2), the hopper needs a rotary return when it reaches the top of the wall to guarantee the plastering plate moves to the top of the wall, so the plastering has no dead space. At the same time, the plastering plate should not stop rotating unit it is vertical. The vertical plastering plate can have a floating function during the falling process. In



addition, the hopper volume should meet the mortar requirement that the plastering machine can move to the house roof. The angle of inclination at the bottom of the hopper should meet the requirement that the mortar can flow into the crack between the plastering plate and the wall during the plastering process. It has been measured by experiment that the angle of inclination β should be bigger than 23° .

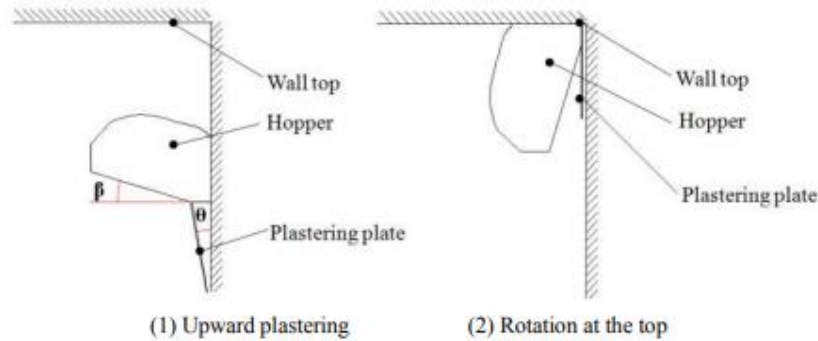


Figure 1. The working condition of the plastering device.

II. CONCLUSION

This thesis designs a plastering device that integrates functions including mortar supply, plastering, surface flattening, and compaction. The main results are as follows.

- (1) The mechanical structure utilizes the principles of cam mechanism and connecting rod mechanism to achieve the processes of filling, plastering, flattening, and compacting during the plastering process,
- (2) The hopper outline is designed using the cam principle, which guarantees stability when it rotates downward and prevents impact.
- (3) The selection process of pneumatic spring should consider the force condition of upward plastering and downward flattening. During the upward process, the pneumatic spring supports the hopper filled with mortar. After reaching the top of the plastering, the pressure on the roof wall is used to overcome the spring force and flip the hopper. The entire working process of the device does not require additional power input.
- (4) Maximal driving power required by the plastering device during its upward process and reversal process is achieved, which provides the basis for choosing the power of the driving motor.

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