

# Design of position detecting device for feeding mechanism of bending machine

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## Abstract

**In this paper, a position detecting device is applied to the feeding mechanism of the bending machine. The device is composed of a touch plate, a bottom groove, a pin shaft, a limit rod, a micro switch and a return spring. The micro switch is driven by the rotation of the touch panel, and the position detection of the bending member is converted into angular displacement detection, and the detection range is wide, the structure is simple, and the reliability is good.**

## Keywords

**Bending machine, feeding mechanism, numerical control, position detection.**

## 1. Introduction

As a basic bending equipment, the bending machine can process a variety of complex parts by replacing the upper and lower molds. The operation is simple and the applicability is wide. Therefore, it has been widely used in the manufacturing industry [1,2]. At present, the research on angle bending, springback and compensation of bending parts has been relatively mature [3], but the feeding mechanism still needs manual operation, the degree of production automation is not high, there is a phenomenon of low processing efficiency and unstable precision control [4, 5]. Therefore, according to the production process of the bending machine, the digital transformation of the feeding mechanism is particularly important.

In the process of digital transformation of the feeding mechanism, the position of the push rod of the feeding mechanism needs to be coordinated [6]. Since the push rod runs along the guide rail perpendicular to the bending machine, one-dimensional coordinates can meet the requirements. In this context, this paper designs a position detection device. After this device is installed on the push rod, the position of the push rod can be coordinated without changing the structure of the push rod.

## 2. Structure design of position detection device

According to the bending process of the press brake [7], the push rod of the feeding mechanism needs to first push the bending piece to the specified position during the operation, and then the push rod retreats, the upper mold presses down, and completes a bending; the process cycles Continue until all the bending processes are completed. The position layout diagram of the feeding mechanism is shown in Figure 1.

In the digital control scheme of the feeding mechanism, the position of the steel plate needs to be accurately judged by the contact between the push rod and the steel plate, and after the steel plate is bent, as the bending angle and the width of the bending part are different, it is The contact position of the rod will also change, so it is necessary to expand the effective contact area of the push rod to increase the processing range.

In order to achieve the above effects, polar coordinates are used on the push rod to detect the contact state. A bottom groove is installed at the front end of the push rod triangle plate, and

the bottom groove and the contact plate are connected together by a pin shaft, and the contact plate rotates freely around the pin shaft. In the bottom groove, a return spring, a limit rod, and a micro switch are arranged in sequence from top to bottom, and the top rod is installed inside the touch plate. The structure diagram is shown in Figure 2.

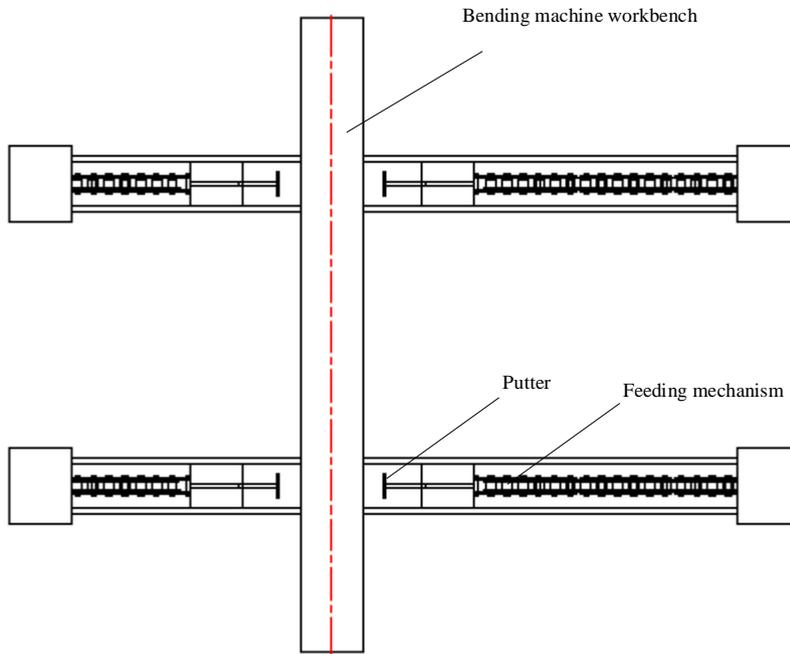


Figure 1: Schematic diagram of the position of the feeding mechanism

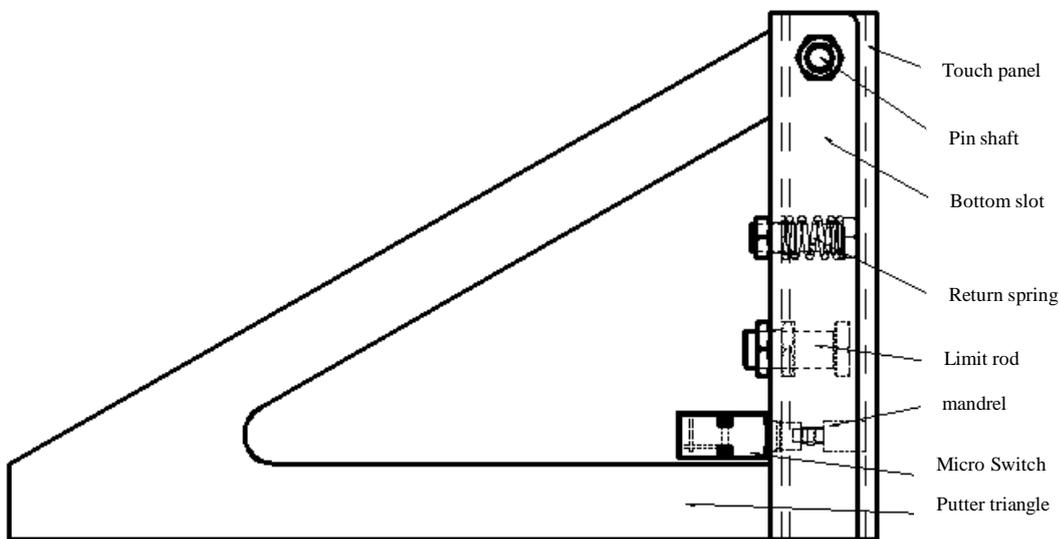


Figure 2: Schematic diagram of the feeding mechanism

### 3. Working principle of position detection device

The bottom groove and the push rod triangle plate are welded together, and the contact plate and the bottom groove are connected together by a pin shaft and can rotate freely around the pin shaft. The pin shaft hole is located at the upper end of the bottom groove. A return spring, a limit rod, and a micro switch are sequentially installed in the bottom groove from top to bottom; a top rod is installed on the touch panel to push the micro switch.

When the push rod moves forward, the touch plate first contacts the steel plate. As the push rod continues to move, the touch plate rotates around the pin axis and moves back. The push rod on the touch plate presses down the micro switch contact and sends a status command. At the same time, the limit rod is in contact with the touch plate to limit the displacement of the touch plate and play a role in supporting and protecting the micro switch.

When the push rod moves backward, the touch plate and the steel plate gradually come out of contact. Under the action of the return spring, the touch plate bounces, the push rod and the micro switch are out of contact, and the detection device returns to the initial state.

#### 4. Conclusion

(1) When the device detects the position of the bent part, it is not affected by the height of the bent part, and can perform position detection in a larger range.

(2) The device converts the position detection of the bending parts into angular displacement detection, with high sensitivity and reliable detection accuracy; simple structure, able to adapt to the harsher working environment, and high reliability.

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