



Perfection Spring and Stamping Corp.

Defining What We Do & Glossary of Terms

FourSlide/Multislide Stampings

A four-slide, also known as a multislide, multi-slide, or four-way, is a metalworking machine tool used in the high-volume manufacture of small stamped components from bar or wire stock. The press is most simply described as a horizontal stamping press that uses cams to control tools. The machine is used for progressive or transfer stamping operations.

Many people familiar with Fourslide machines believe that it can do everything a punch press can do...and more. To put it simply, a fourslide machine is a stamping plant in itself. Where a punch press uses a progressive die to blank out metal parts and stampings, a slide machine goes a step further. After the primary "cuts" are made in the metal strip, with the addition of cams, slides, stock straighteners and slides feeding into and around the strip, complex shapes, forms and secondary operations can be completed before the final part is ejected from the machine. Though the tooling is complex, and may seem a bit expensive at first, often the cost savings in piece price by eliminating costly secondary operations can be quickly make up for the high tooling cost.

Design

A four-slide is much different than most other presses. The key of the machine is its moving slides that have tools attached, which strike the work piece to form it. These slides are driven by four shafts that outline the machine. The shafts are connected to bevel gears so that one shaft is driven by an electric motor, and then that shaft's motion drives the other three shafts. Each shaft then has cams which drive the slides, usually of a split-type. This shafting arrangement allows the work piece to be worked for four sides, which makes this machine extremely versatile. A hole near the center of the machine is provided to expel the completed work piece.

Advantages and disadvantages

The greatest advantage of the four-slide machine is its ability to complete all of the operations required to form the work piece from start to finish. Moreover, it can handle certain parts that transfer or progressive dies cannot, because it can manipulate from four axes. Due to this flexibility it reduces the cost of the finished part because it requires less machines, setups, and handling. Also, because only one machine is required, less space is required for any given work piece. As compared to standard stamping presses the tooling is usually inexpensive, due to the simplicity of the tools. A four-slide can usually produce 20,000 to 70,000 finished parts per 16-hour shift, depending on the number of operations per part; this speed usually results in a lower cost per part.

The biggest disadvantage is its size constraints. The largest machines can handle stock up to 3 in (76 mm) wide, 12.5 in (320 mm) long, and 3/32 in (2.4 mm) thick. For wires the limit is 1/8 in (3.175 mm). Other limits are the travel on the slides, which maxes out at 3/4 in (19.05 mm), and the throw of the forming cams, which is between 7/8 and 2 in (22 and 51 mm). The machine is also limited to only shearing and bending operations. Extrusion and upsetting operations are impractical because it hinders the movement of the work piece to the next station. Drawing and stretching require too much tonnage and the mechanisms required for the operations are space prohibitive. Finally, this machine is only feasible to use on high volume parts because of the long lead time required to setup the tooling.

Materials

The material stock used in four-slides is usually limited by its formability and not the machine capabilities. Usually the forming characteristics and bending radii are the most limiting factors. The most commonly used materials are:

Low-carbon cold rolled steel

Spheroidized cold rolled spring steel

Type 300 and 400 stainless spring steels

Copper alloys

Beryllium-copper alloys

Glossary of Terms

Baking – The “Stress relieving” of parts that are over a hardness of HRc 30, that have had an electroplating operation. The baking process Stress relieves to prevent “Hydrogen Embrittlement”

Stress Relieving - Stress relieving parts that are formed (both springs and metal stampings), the process will allow the residual stresses to release themselves, prolonging service of the parts and relaxing to a shape that would naturally occur if left on a shelf for long period of time.

Cams – Cams on Slide Machines transfer rotary motion from the drive train to linear motion on each slide. rise, and fall control the length of the action and dwell controls the timing that the tools is held in place. A separate cam controls, each of the basic functions, feed, primary die action (each die), Front tool, rear tool, left tool , right tool, top action . Each slide if fully independent of each of the other slides are fully adjustable.

Centre Post - This is a fixed tool mounted to the Centre tool Head that is a mandrel for forming.

Form Tools - These are the front, rear, left, right tools that will form the required features on the part.

Positive Blank holder - The positive Blank holder will position the strip in position and move forward to clamp the blank between the centre post and the blank holder, once clamping is established a cutoff cuts the blank free of the strip for forming around the centre post.

Progressive Die – These are similar in design and appearance to those used in punch presses. Multiple progressive dies are commonly set up in slide machines. This allows segregation and separation of operations. Example :A progressive die process a strip, the strip exits the die, the strip has a tapped hole added, the strip enter a second progressive die to trim features around the tap hole. The strip exits the progressive die for cut-off and additional forming prior to be being discharged from the machine.

Residual stress - Stresses mechanically induced by set removal, shot peening, cold working, forming or other means. These stresses may or may not be beneficial, depending on the application of the spring, wireform or stamping.

Set - Permanent distortion in length, height, or position which occurs when a spring is stressed beyond the elastic limit of the material.

Slide Tool Set – These are the custom component tools that mount to the front, rear, left, right slides with a centre post, they are built with a cutoff tool and or a progressive die to process the raw material. All slide tools are driven into position using a cam that works off of the rotational motion of the machine. We endeavor to select standard cams prior to building any specially required cams.

Top Action – This is an ancillary action with very low power that is transferred from the powertrain, through a cam action and is accomplished with a rocker assembly. The top action acts in the vertical access to positively push the formed part off of the centre post as required.

Shot peening - Blasting the surfaces of the spring with pellets to induce compressive stresses and relieving residual stresses from forming and thereby improving fatigue life.

Stress range - The difference in operating stresses at minimum and maximum loads.

Stress relieve - To subject springs to low-temperature heat treatment so as to relieve residual stresses.

Wire Line - This is a basic term and a basic dimension used with Fourslide/Multislide equipment. All tooling is built to match the wire line designed for the original machine.

Reference: From Wikipedia.com, the free encyclopedia and CJ Labonack, US Baird Corp..