Design and manufacturing of plastic injection mould

11 – Undercutted parts

Undercutted part
- Hidden feature from the opening direction
- Size / Shape / Matching of the inserts

Example 1

Example 2-3

Design facilities
- Moving insert
- Conventional ejection bar
- Ejection rod
- 2 stage ejector
- Slider
- Lifter
- Spring core

Moving insert
- In case of proto moulds
- Move with the plastic part
- Ensure the position of the insert
- Fixture for disassemble of insert and part
### Conventional ejection
- Simple undercut,
- Surface can be damaged.

### Ejection rod
- Ejection bar with form.
- Simple undercut.
- Demoulding can be problematic.

### 2 stage ejection
- Small undercut.
- Part can be damaged.

### Slider
- Insert, which is moved to the direction of the undercut
- Problems:
  - Closing
  - Moving
  - Guiding
  - Fixing

### Moving
- Moving by angle pin
- Moving in time of opening
### Geometric parameters

\[ \tan \alpha = \frac{H}{L} \]

\[ H = L \cdot \tan \alpha \]

\[ \alpha_{\text{max}} = 30^\circ (18^\circ \cdot 22^\circ) \]

### Design

- Angle pin
- Holder insert
- Slider body
- Wear plate
- Guide rail
- Flat guiding stock

### Slider body

- Shoulder for guiding (5x5)

### Angle pin

- 1 or 2 pin

### Holder insert

- Egyszerűbb gyártás

### Guide of the slider

- Guide
- Fitting in mould plate (dowel pin and slot)
- Fixing by screws
- Self lubricated of hardened
- In case of wide slider more guiding elements can be used
Pressure insert and wear plate
- Erő felvétele
- Zárás beállítása
- Formalappból kialakítva

Pressure insert
- Külön alkatrész
- Megfelelő illesztés és rögzítés
- Kopólappal vagy a nélkül

Pressure insert

Recommended geometric par.

Fixing the open position
- In open stage the position of the sliders have to be fixed
- The recommended slider direction is level
- Ball screw
- Hole in the slider
- Bottom of the slider or in the slide (not recommended)
Fixing the open position

Moving of sliders
- Z rod
- Moving after the opening

Z rod
- Ensure alternative mould building
Drive by hydraulic cylinder

- Long move
- In the A side
- Action before opening
- In mould or standard cylinder

Mini slider

Special slider

The combination assembly is oriented by an angled shelf installed in the cavity. Upon mold closing, the shelf comes the core piece forward into the molding position. When the mold opens, the core pin retracts 20° of travel and is captured by the bail handle.

Special slider

Lifter

- Small undercut
- No space for slider
- Space for lifter exists
- Support the ejection
- The slip of the part must be eliminated
Typical application

Design constrains

Space required to the moving
Lifter will crash to the rib

Drive by spring

Moving by ejector plates I.

- Straight ejection
- Drive by insert

Moving by ejector plates II.

Head design

- One piece
- Hole + Dowel pin
- Screw
- Taper surfaces are needed in the plate