



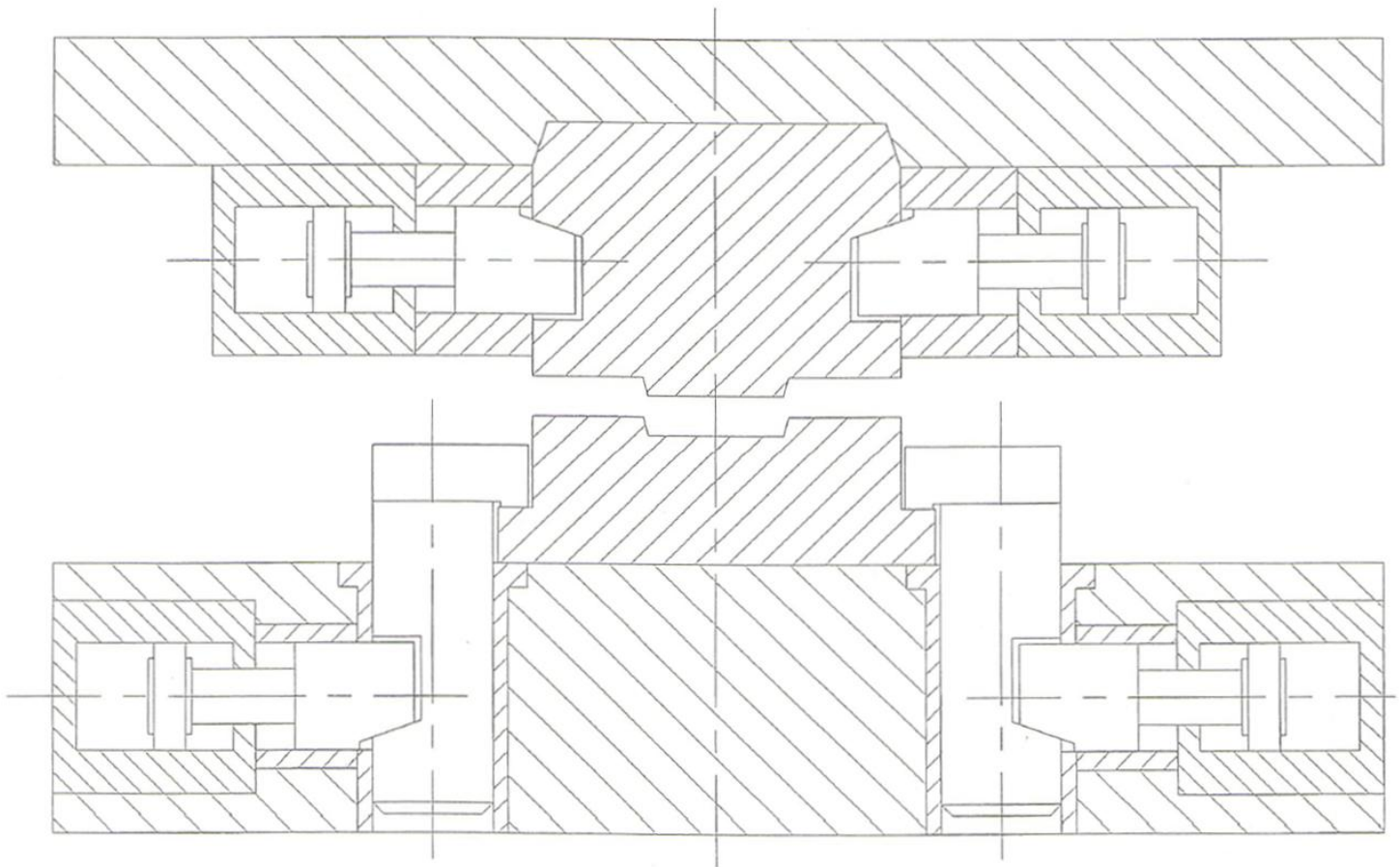
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HILMA ■ STARK

HYDRAULIC WORKHOLDING ■ MACHINE VISES ■ ZERO POINT MOUNTING  
QUICK DIE CHANGE ■ QUICK MOLD CHANGE ■ MAGNETIC CLAMPING  
PRODUCTS FOR ASSEMBLING

# HILMA Quick Tool Change for Forging Applications

Upper tool is seated in pocket of the master die  
set clamped with Hilma Wedge Clamps

Lower tool is clamped with vertical clamping bars  
locked in place with Hilma Wedge Clamps



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# Quick-die clamping systems for forging presses

## Clamping alternatives in forging shops

	Conventional mechanical clamping elements	Mechanical clamping elements	Hydro-mechanical clamping elements	Hydraulic quick-die clamping elements
<b>Clamping principle</b>	<p>The clamping force is transmitted to the forging die via screws and clamping elements such as wedge clamping bars and clamping arms</p> <p>Clamping and unclamping is made manually</p>	<p>The clamping force is built up by mechanical elements such as Belleville springs, toggle levers, cams and transmitted to the forging die via clamping elements such as pressure pads</p> <p>Clamping and unclamping is made manually</p>	<p>The clamping force is built up by Belleville spring assemblies, toggle levers or wedge systems and transmitted to the forging die via clamping elements such as pressure pads</p> <p>Clamping is made mechanically, unclamping is made hydraulically</p>	<p>The clamping force is built up by constant hydraulic pressure and transmitted to the forging die via clamping elements such as pressure pads</p> <p>Clamping and unclamping is made hydraulically</p>
<b>Application</b>	Low die change frequency	Low/medium die change frequency	Medium/high die change frequency	High die change frequency
<b>Limits in technical terms</b>	<p>Preload and tightening torque of screws</p> <p>Clamping operation can be controlled</p>	<p>Clamping forces and clamping ranges are limited by the size of the clamping element</p> <p>Clamping operation can be controlled</p>	<p>Clamping forces and clamping ranges are limited by the size of the spring assembly</p> <p>Clamping operation can be controlled</p>	<p>Temperature and separating agents affect the sealing material and the hydraulic fluids</p>
<b>Advantages</b>	<p>Cost effective</p> <p>Simple design</p> <p>Space-saving</p> <p>Low maintenance</p>	<p>Low cost</p> <p>Clamping and unclamping cycles sufficiently short</p> <p>Easy handling</p> <p>Low maintenance</p>	<p>Short clamping and unclamping cycles</p> <p>No or almost no handling</p> <p>Automation possible</p> <p>Unpressurized hydraulic system</p> <p>Suitable for clamping of floating die</p>	<p>Short clamping and unclamping cycles</p> <p>No or almost no handling</p> <p>Automation possible</p> <p>Compact design</p> <p>Large clamping ranges</p> <p>High and adjustable clamping force</p> <p>Very suitable for float clamping of die</p>
<b>Disadvantages</b>	<p>Long clamping and unclamping time</p> <p>Time-consuming alignment and adjustment</p> <p>Clamping and unclamping require manual work</p> <p>Detached components during change</p> <p>No automation possible</p> <p>Not suitable for float clamping of die</p>	<p>Clamping and unclamping require manual intervention</p>	<p>Expensive</p> <p>Line connection to movable part of the die</p>	<p>Expensive</p> <p>Safety measures and monitoring system required</p> <p>Line connection to the movable part of the die</p>

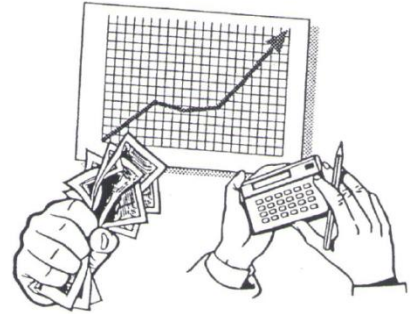
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## 1. Why quick die clamping systems?

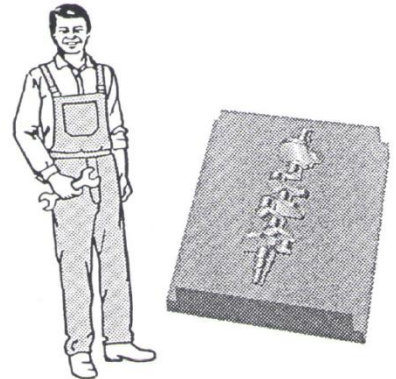
### 1.1. Economic efficiency

- 1.1.1. Short set-up times allow small lot sizes to be handled. Machine downtimes, e.g. in case of die breakage, can be reduced by easy changeover to another forging.
- 1.1.2. Die changing is easier for the operator and does not require staff specially trained for this purpose.
- 1.1.3. As the die is clamped by applying high forces, the number of clamps can be reduced to a minimum.
- 1.1.4. The number of pieces produced by one forging die can be increased.
- 1.1.5. Run-in periods are no longer necessary or can be considerably reduced, since the die is properly centered and located, additional alignment is not needed.



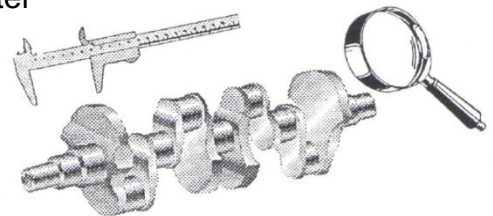
### 1.2. Less wear and tear

- 1.2.1. Uniform clamping without distortion by always using the same positions. This reduces wear and tear and consequently increases the service life of the dies.
- 1.2.2. Compensating clamping force (elasticity): even in case of die shrinkage or expansion due to temperature variation, the applied clamping force remains unchanged.
- 1.2.3. Repeatability of clamping and positioning, especially with regard to material handling equipment, is ensured.
- 1.2.4. Optimum selection of the clamping locations: they can be determined according to the machine conditions.



### 1.3. Improved quality

- 1.3.1. Finished forgings have a constant quality level, even after production of many pieces and frequent die changes.
- 1.3.2. The die position during clamping is reproducible.
- 1.3.3. Low-distortion clamping is ensured.

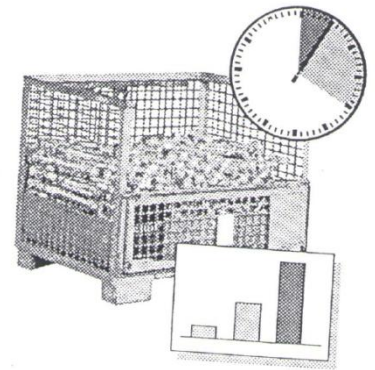


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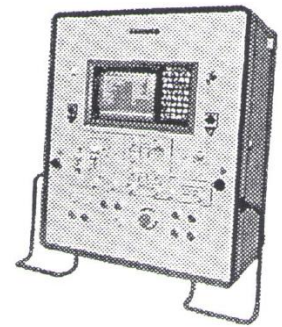
## 1.4. High productivity

- 1.4.1. Thanks to shorter set-up times, more capacity and high availability of the press.
- 1.4.2. Run-in periods are no longer necessary or can be considerably reduced, centering is improved.
- 1.4.3. Less downtime in the cost intensive press line in case of die breakage or rework.



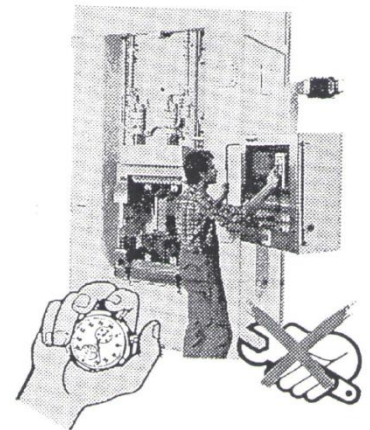
## 1.5. Automation

- 1.5.1. Power operated clamping elements
- 1.5.2. Special monitoring systems, suitable for very difficult ambient conditions such as the influence of temperature, separating agents or large amounts of scale.
- 1.5.3. Short clamping cycles thanks to automatic control of functions.
- 1.5.4. Integration of process monitoring and system control provides absolute safety.



## 1.6. Easier operation

- 1.6.1. The clamps can be used even in case of adverse ambient conditions, such as high temperature or spraying agents.
- 1.6.2. Clamping is possible even at points hard to get to.
- 1.6.3. High clamping forces can be applied.
- 1.6.4. Dies can be changed by the machine operator.
- 1.6.5. Die change is repeatable.
- 1.6.6. High clamping forces are achieved with the use of small clamps.

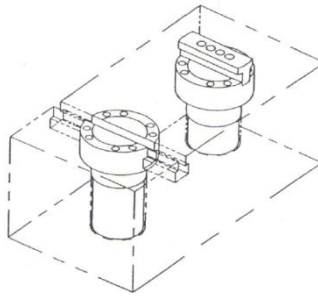


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## 2. Hydro-mechanical clamping elements

2.1. When using spring clamping cylinders, clamping is in most cases made mechanically by Belleville spring assemblies, and unclamping is made hydraulically. Since the clamping force changes as a result of temperature variations, such variations should always be considered when designing the system. Integration of position monitoring would be very costly and is therefore not advisable.

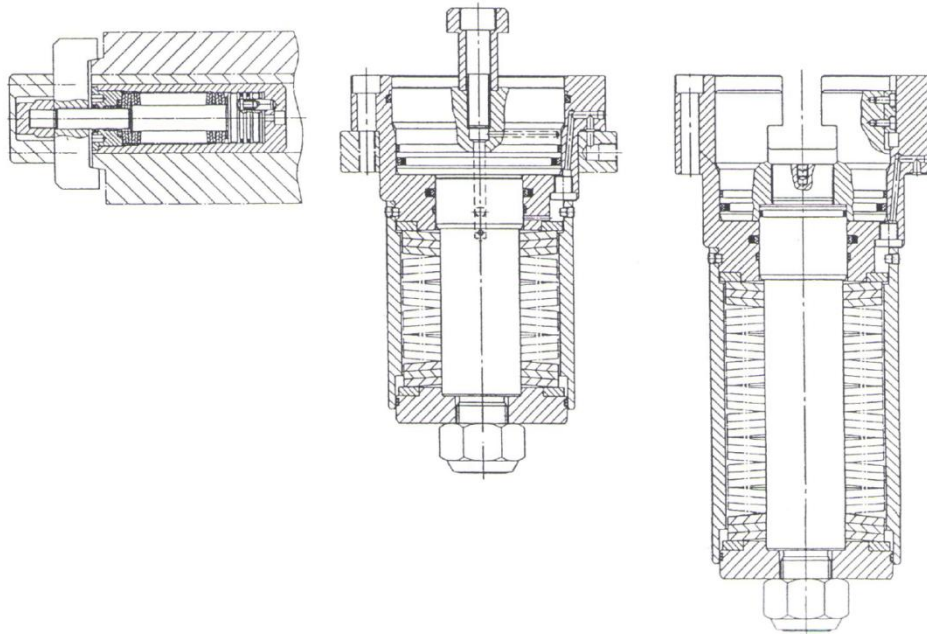


### Clamping:

A Belleville spring assembly in a housing pushes or pulls a clamping bolt directly or indirectly onto the forging die. The clamping force is limited by the spring characteristic and has to be rated accordingly. Under the influence of temperature, the clamping force changes in accordance with the spring characteristic. In case of an automatic operating cycle, clamping and unclamping position have to be monitored. In the clamped position, no hydraulic pressure is available for monitoring purposes.

### Unclamping:

Hydraulic pressure is built up by a pump unit, and the spring assembly is compressed until the clamping bolt releases the forging die.



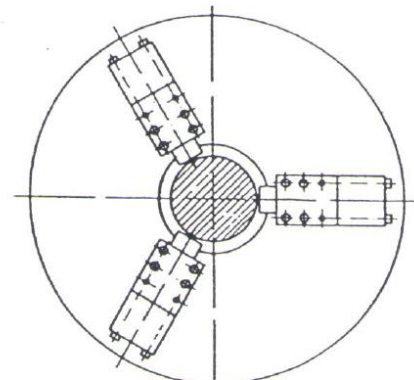
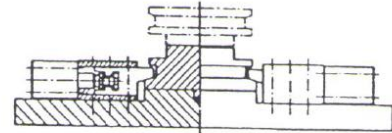
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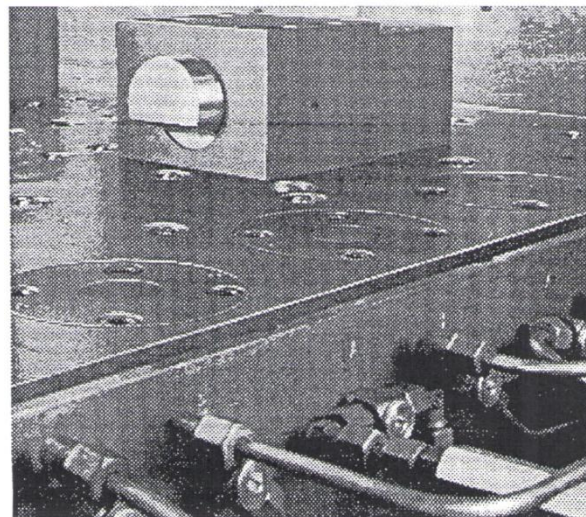


### 3. Hydraulic clamping elements

- 3.1. Wedge clamps are the most simple and robust clamping elements for use in forging presses. The clamping bolts are separated from the operating cylinder. The hydraulic system is not in direct contact with the dies which are usually at very high temperatures.



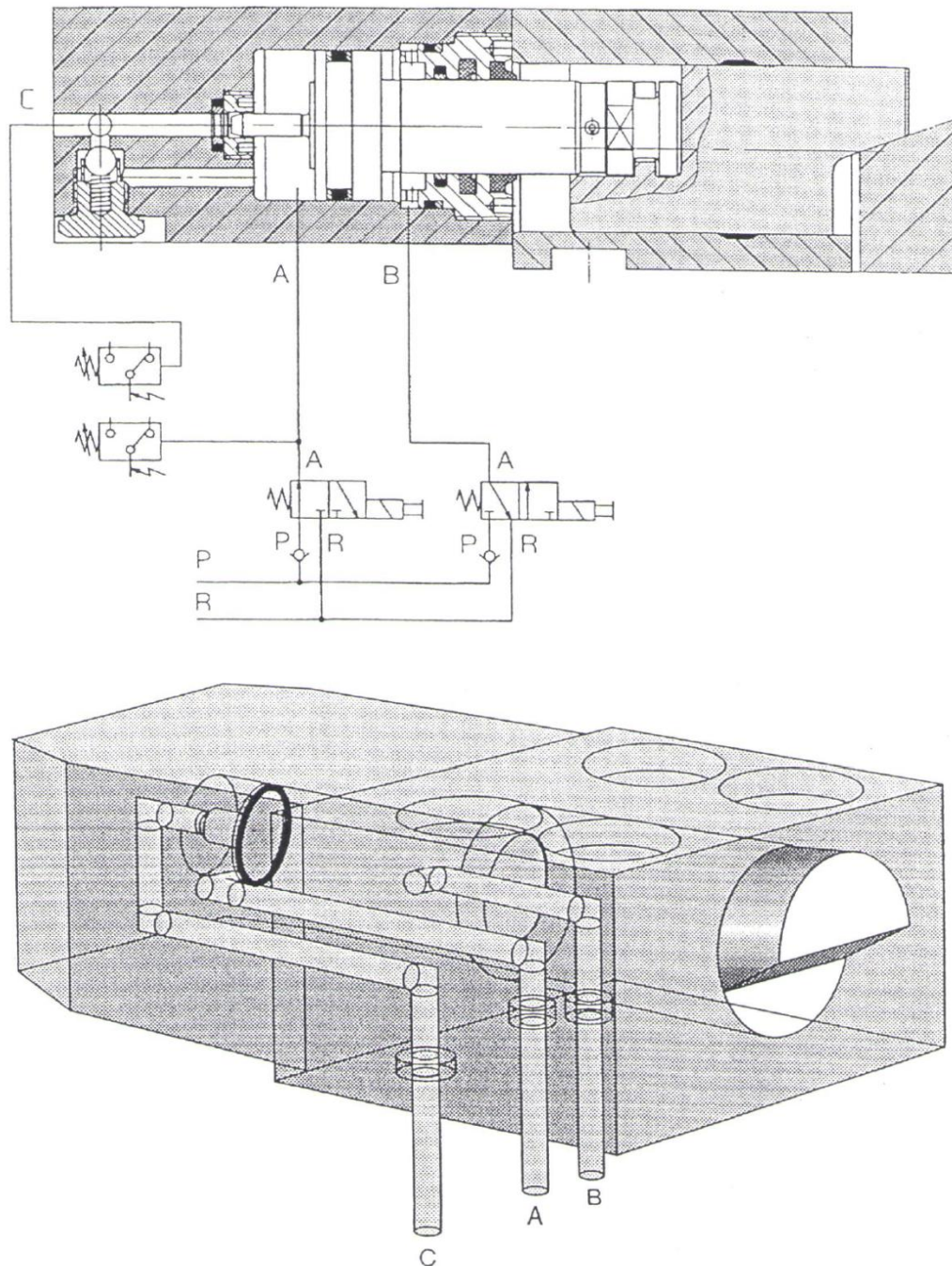
The clamping bolt, which has a 20° bevel, clamps on the mating beveled clamping surface of the die. Thanks to the large wedge angle, the die is held in a self-locking manner, which ensures maximum safety, even in case of failure of the hydraulic pressure. In automatic operation, an even higher safety level is achieved by permanent monitoring of the clamping position. The use of proximity or limit switches is limited to a temperature of 250°F (120°C). In forging shops, however, temperatures are much higher, often between 320-400°F (160-200°C). Plus, the ambient conditions, with exposure to separating agents and scale, do not allow the use of electrical switches.



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Block cylinders specially designed for this application includes an integrated sequence valve. This valve controls the hydraulic flow to downstream clamps and provides for positioning monitoring. After a defined stroke, the valve, which is integrated in the cylinder, opens a control port. The hydraulic pressure is passed on to the next clamp in the row or to the pressure switch at the end of the row. The pressure switch then provides a press enable or emergency stop signal to the press controls.

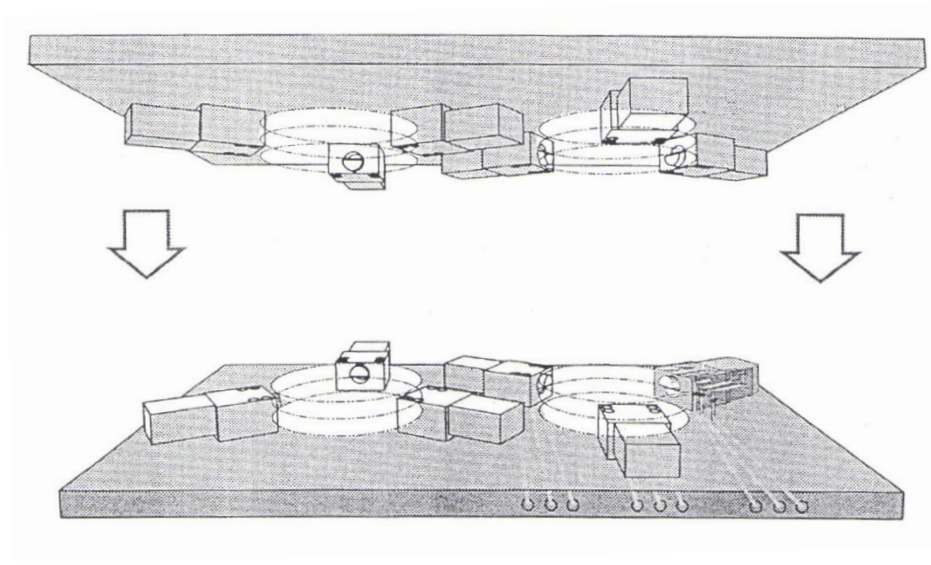


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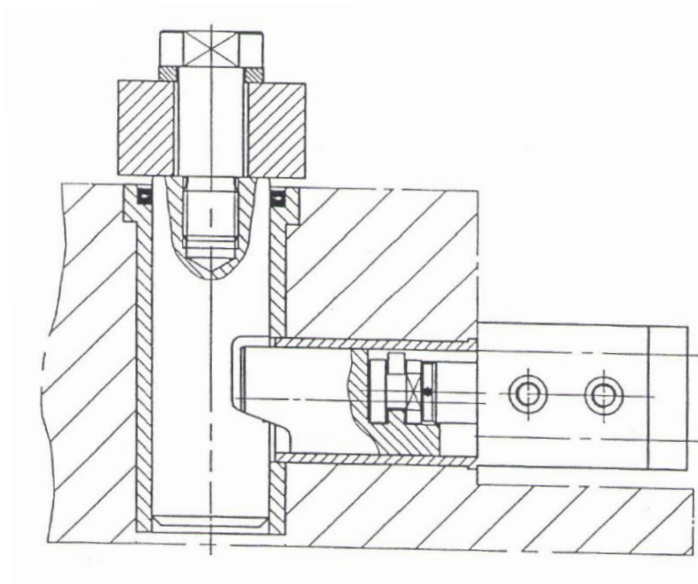
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The hydraulic system requires tubes for hydraulic oil supply and distribution. In order to protect such tubes from damage, they should be laid in covered ducts. If this is not possible, deep holes should be drilled into the die set. Connection to the clamps is then made via plug-type connectors.



Wedge clamps can also be designed to be integrated into the die set. In such a case, additional clamping arms are used for clamping. This alternative offers even a higher safety level, and the cylinders are protected from the effects of adverse ambient conditions.



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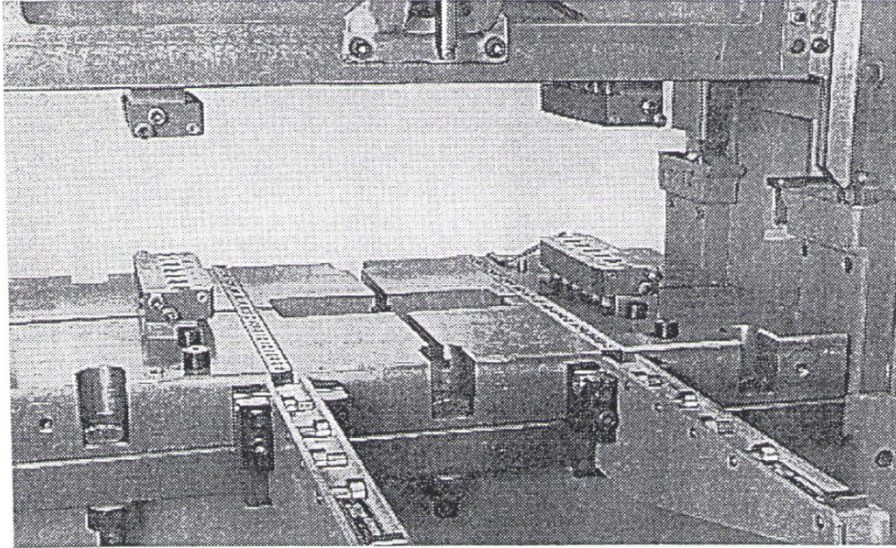
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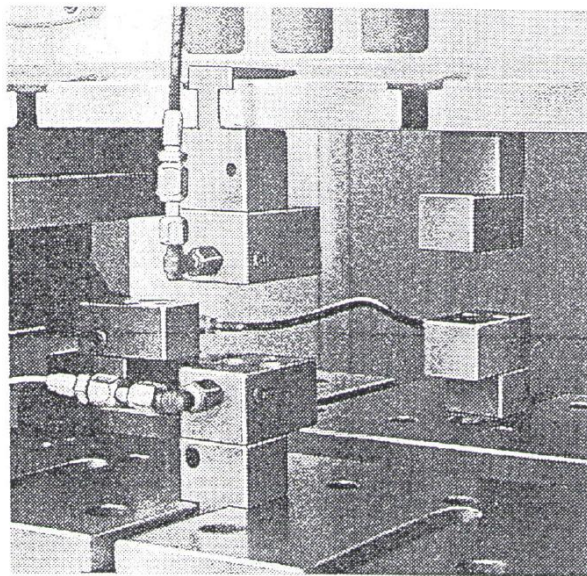
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PRODUCTS FOR ASSEMBLING

3.2. Ledge clamps are used when high temperatures, separating agents etc. are not of decisive importance, e.g. in trimming presses. In case of ledge clamps, the clamping pistons act directly upon the clamping edge.



3.3. When it is appropriate to use hollow piston cylinders and sliding clamps in forging shops, seals and wipers must be modified and special clamp shields and hoses must be used.



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