

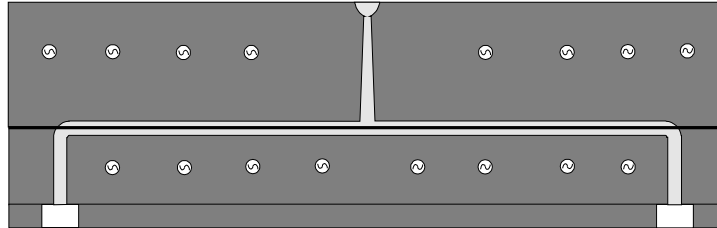
Cold Runner Block Technology

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Harald Schmid
General Sales Manager

1. Comparison of different cold runner block systems

1.1 Divided cold runner distributor block (fig. 1)



Advantages:

- Good handling of the flow runners
- Good accessibility in case of failures or if cleaning is required
- Low production costs

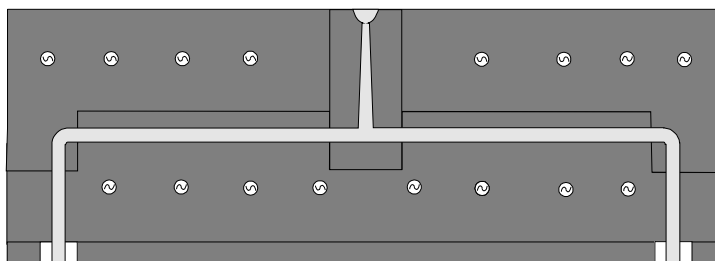
Disadvantages:

- Film formation in the split line due to higher injection pressures. The larger projected area created by that causes on the other hand the system's bending open. Intensive screwing of the platens was supposed to reduce this phenomenon, but this succeeded in exceptional cases only. Moreover, on account of the more extensive dismantling works, the main advantage, i. e. easy cleaning in case of failures was no longer given. Partly more than 100 screws had to be opened as far as great cold runner block systems were concerned.

Remark:

In order to compensate the aforementioned disadvantages, some manufacturers are using insertion tube systems in the split line. This solution results in system-conditioned disadvantages as well as in increased dismantling works when cleaning (see fig.: 1.3).

1.4 Partially closed cold runner distributor block (fig. 4)



Advantages: - Good accessibility of the flow runners

Disadvantages: - Extremely high production expenditure

- Supply of spare parts for inserts is not possible due to manual touching up

The evaluation of the individual cold runner block systems shows that none of the mentioned ones integrates all advantages.

With regard to the expenditure to be involved, the closed cold runner block system represents the optimal compromise.

Owing to corresponding modifications, the disadvantages of Desma cold runner blocks have been minimized.

2. Developments up to now

Optimal injection properties and a long-lasting, solid design have always been a feature of closed Desma cold runner blocks. In case of failures or compound changes, however, it was necessary to dismount the whole cold runner block system and to clean it manually. Time needed for that was enormous and induced other manufacturers to put divided cold runner block systems with insertion tubes on the market. These cold runner blocks also have great technical disadvantages which are to be attributed to their design.

Owing to new and further developments of closed cold runner block systems, KLÖCKNER DESMA Elastomertechnik dispose of systems which largely comprise the cleaning advantages of divided cold runner blocks with insertion tubes.

Another disadvantage of closed cold runner block systems with lengthened and tempered nozzles was that injection into the air for purging purposes was only feasible with close-lying mould plate. One reason for this was the spring-mounted slide nozzle only held by a locking ring. This often resulted in the destruction of nozzle supports resp. main deviating gates within the block area. Solutions for the standardization of the electric installation were searched for which were meant to supersede the conventional individual methods "in the mould makers' style".

3. New developments respectively modifications

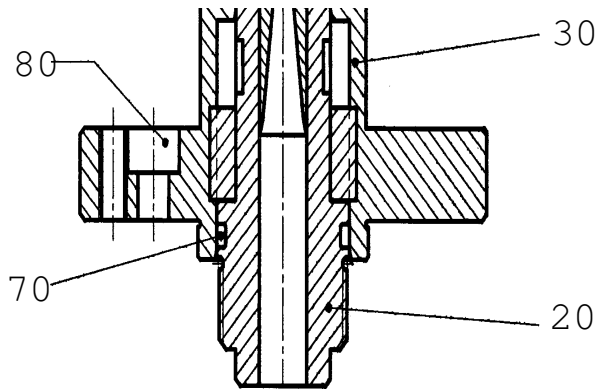
3.1 Nozzle area

B Please refer to the following figure "nozzle system with hexagonal swivel nut".

The system of a spring-mounted slide nozzle (pos. 10/50) enables a compensation of process tolerances of the dipping depth between cold runner block nozzle and mould. Apart from that, the spring washers (pos. 50) guarantee a safe nozzle contact, even in case of bumping functions.

If, due to a sequence failure, the compound cures completely within the nozzles, it is now possible to remove the material from the nozzles via injecting into the air without close-lying mould plate. The mechanical solidity required for this procedure is achieved by using a hexagonal swivel nut dimensioned correspondingly within the nozzle area. Furthermore this design makes an easy dismounting of the slide nozzle possible.

The nozzle support (pos. 20) is screwed in with a fine-pitch thread thus considering the forces which occur within the whole nozzle area.



- Pos. 10: slide nozzle
- Pos. 20: nozzle support
- Pos. 30: nozzle body
- Pos. 40: disk
- Pos. 50: spring washer
- Pos. 60: O-ring
- Pos. 70: O-ring
- Pos. 80: -----
- Pos. 90: hexagonal swivel nut

Fig. 5: Nozzle system with hexagonal swivel nut

Owing to additional modifications within the block area, it is possible to renounce of dismounting and boring works even in case of completely cured distribution systems in the cold runner block. The measures as described below enable cleaning in case of a failure or if changing the compound without having to disassemble the cold runner block system.

3.2 Block area

Please see the following figure "complete cold runner block".

In order to resist injection pressures up to 3.000 bar within the block area without close-lying mould plate, it was indispensable to fit the distributor deviations (pos. 10) with threaded bolts (pos. 20) dimensioned correspondingly.

In the complete runner area boring properties of a roughness of $Rz\ 10 - 12\ \mu m$ are prescribed to minimize cold runner block contaminations which are due to the runners' "overgrowing".

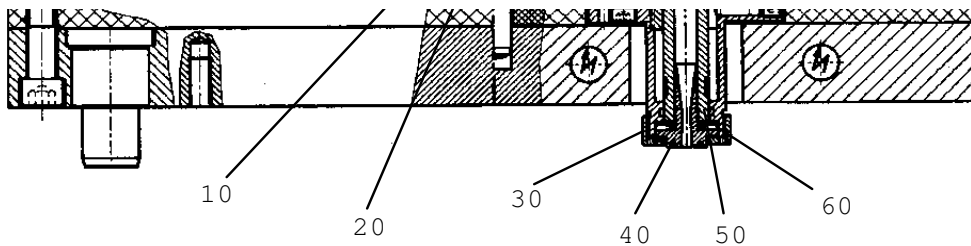


Fig. 6: Complete cold runner block

Pos. 10: distributor deviations

Pos. 20: threaded bolt

Pos. 30: hexagonal swivel nut

Pos. 40: slide nozzle

Pos. 50: nozzle body

Pos. 60: spring washer

3.3 Temperature control of the complete system

In general the cold runner system is temperature-controlled in 2 decks which can be activated also separately.

The bores for nozzle temperature control are also arranged in separate cooling circuits in the cold runner block i.e. there is no pipework liable to failures. The nozzles are combined in groups allowing a separate control.

In case of using only one temperature control unit, the individual circuits are connected by pipes outside of the system. Thus a separation of the temperature circuits at a later stage is possible.

4. Standardization and introduction of a wiring conforming to standards

Please refer to the following figure "Cable box with connection technology conforming to standards".

In general only cable boxes conforming to standards with adequate sealing against water are used having the following advantages:

- easy access when servicing
- by using prescribed components a high security standard often not common in the field of mould making, is granted
- wiring easy to survey
- defect heating cartridges can be exchanged without dismounting of cable box
- standardized connection technology due to standard plugs at the cable box
- heating cartridges are connected separately at a terminal board, thus modifications of heating circuits at a later stage are possible
- several heating circuits are possible (optional)

The heating platen of the cold runner block is in general equipped with heating cartridges with higher performance at both ends. Additionally the sides of the heating platens are equipped with more efficient cartridges.

Thus a homogeneous thermogram is achieved.

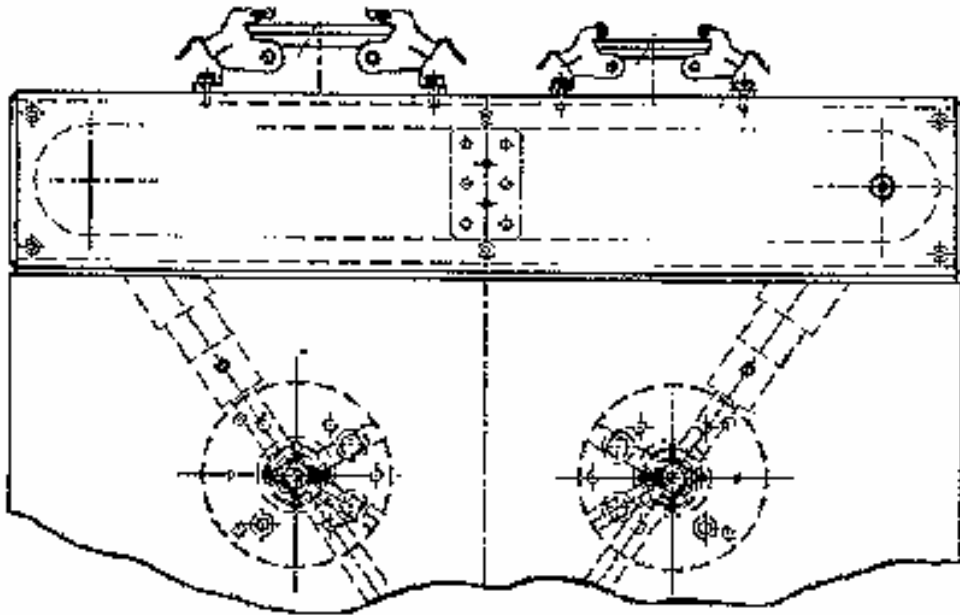


Fig. 7: Cable box with wiring conforming to standards

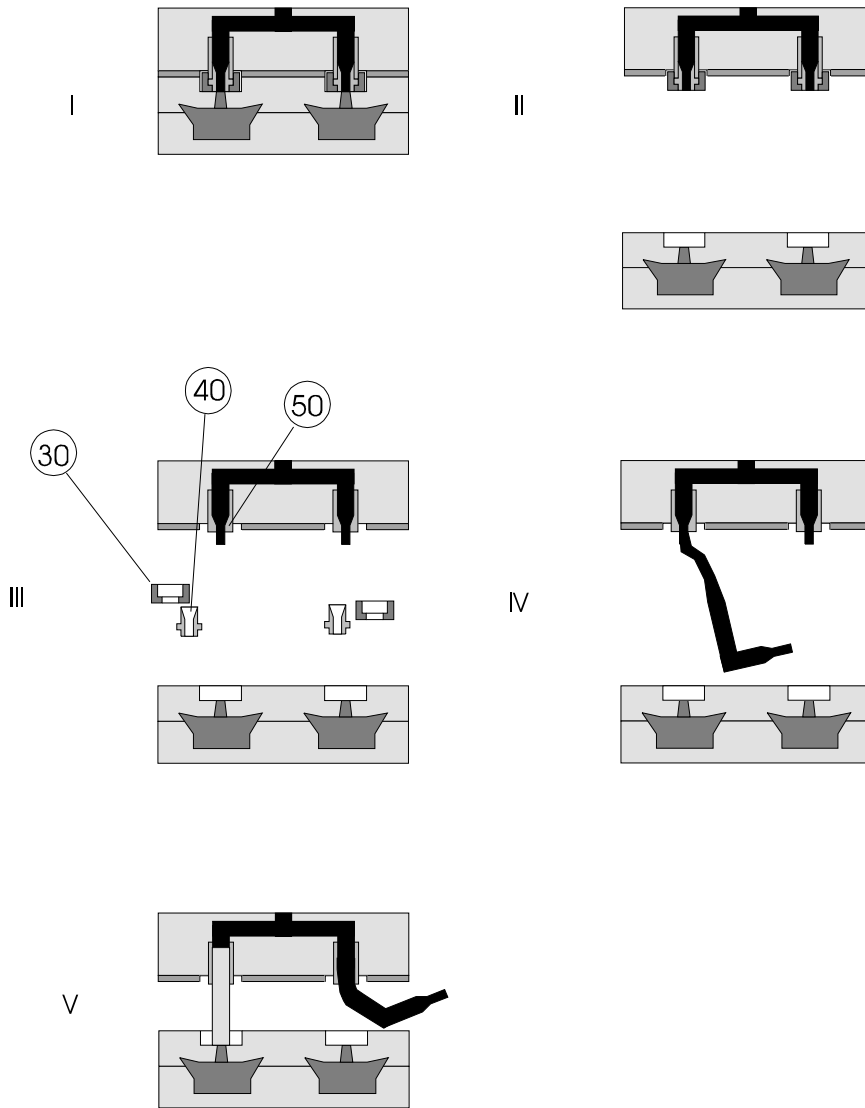
5. Process description as to how cured material is removed from the cold runner block system through injection into the air

Above all when changing the material the process described below is the obvious one.

Please refer also to the following figures:

1. Complete curing of compound in cold runner block
2. Mould plates move downward
3. Screwing off of all cap nuts (pos. 30)
4. Pulling of slide nozzles (pos. 40)
5. Injecting into the air of cured material from 1. runner
6. Removal of cured material after being injected into the air from 1. runner
7. Insertion of aluminium round stock (of approx. 100 mm length) corresponding to slide nozzle diameter (pos. 40) into the purged nozzle
8. Moving clamping unit with mould plate against aluminium bars
9. Injecting into the air of cured material from 2. nozzle of cold runner system
10. Clamping unit moves downward from aluminium bolts
11. Removal of cured strip after being injected into the air
12. The aluminium bars are dislocated

The whole process to be repeated for all nozzles.



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|------|---|------------------------|
| I: | Cold runner block with completely cured material | pos.30: Cap nut |
| II: | Cold runner block with lowered mould plate | pos.40: Slide nozzle |
| III: | Cold runner block prepared for injection of Cured material into the air | pos.50: Nozzle support |
| IV: | Cold runner block with aluminium bars | |