Funnel Mechanism for IS 5 ½”, IS 6 1/4 “ and AIS

1. System Description
The Emhart Glass Funnel Mechanism for center distances DG 5½”, DG 6¼” and TG 4¾” has been fundamentally redesigned.

The principal new feature of the mechanism is its stroke/swing profile. Funnel arm movement now features a combined vertical and horizontal motion generated by a cam roller and rigid cam arrangement. This movement, which is characteristic of Emhart Glass’ new twist mechanisms, is essentially identical to that of the baffle or blowhead mechanisms.

The new design and motion profile enable the funnel mechanism to operate at a considerably higher speed. The time required for funnel arm upstroke can be reduced by up to 48% compared with the previous mechanism. Apart from the increased speed, more precise funnel arm movement and significantly improved upstroke cushioning are also attained. Speed and cushion control valves are now conveniently incorporated in the cylinder head for fine adjustment of upstroke speed and cushioning.
The new high speed funnel mechanism 210-220-1 and the pantograph baffle arm represent Emhart Glass’ new standard for the F, EF 5½, and AIS DG 6½” and TG 4½” IS forming machines. Due to the new motion profile, the funnel arm can be operated only in conjunction with the pantograph baffle arm. The new standard configuration permits up to 300 ms time savings per section cycle for the Blow & Blow process which can be used to either increase blank mold contact time or machine speed.

The new funnel mechanism provides the capability for improved blank mold cooling at the baffle end. New low profile plenum chambers are available to maximize baffle end cooling.
2. **Product Improvements**

The many design features incorporated in the funnel mechanism significantly improve its operating characteristics, prolong service life and reduce mold equipment wear.

3. **Rigid Cam**

The new mechanism now features a rigid cam with a CNC-machined cam track which is closed at both ends and a cam roller arrangement. The cam roller travelling in the cam track produces a combined vertical and horizontal funnel arm movement, or the stroke/swing profile. During the motion sequence, the funnel arm is vertically raised 10 mm followed by a 60° swing during the remaining 50 mm vertical travel.

The cam design improvements yield higher mechanical durability. Higher rigidity enables the cam to better withstand static and dynamic forces and also extends service life.

Proper cam positioning is achieved by a locating recess and a dowel stud. Rigid interconnection with the cylinder base is achieved by 5 pretension bolts which prevent loosening.

4. **Cam Roller Fixation**

The cam roller travels over the entire path of the cam track. It is mounted on a guide bushing and is mechanically connected to the lower end of the piston rod.

This new type of fixation is designed to achieve optimal mechanical connection without mechanically weakening the lower end of the piston rod.

Greater modular standardization has been engineered into the individual parts of the cam roller fixation assembly since is used for all Baffles, Funnels and Blowheads of the 200 Series (EF 4\(\frac{1}{4}\)" and EF 5" mechanisms) and the 210 Series (EF 5\(\frac{1}{2}\) and AIS - DG 6\(\frac{1}{4}\)" / TG 4\(\frac{1}{4}\")).
5. **Top-Mounted Ball Check Valve**

The top-mounted ball check valve opens to permit air flow for the downstroke. It is mounted in the cylinder head as a maintenance convenience. The design of the ball check valve, for which a patent is pending, improves air flow characteristics and the result is considerably higher operating air throughput due to enlarged air passages. For maintenance ease, the check valve can be replaced without mechanism removal from the section frame.

6. **Upstroke Cushion Control Valve**

A precision needle valve is incorporated for fine adjustment of the upstroke cushion control. The needle valve is located on top of the cylinder head.

7. **Upstroke Speed Control Valve**

A speed control valve is incorporated in the cylinder head for fine adjustment of the upstroke speed.

8. **Permanent Lubrication**

The piston rod bearing in the cylinder head is connected to the central lubrication system and oil is supplied to the cylinder head bushing through the frame and centering ring. Lubrication lines are fully integrated in this new design. This prolongs service life, reduces piston rod and bushing wear and aids in the maintenance of cushioning.
9. **Piston Rod Cushioning Ring**

The damping effect of the elastomeric ring during the final movement of upstroke cushioning prolongs both the mechanism and funnel service life.

10. **Improved Blank Mold Cooling**

New low profile plenum chambers with a recessed lock are available for blank side Verti-Flow for improved cooling of the baffle end of the blank mold. The distance between plenum location surface and the baffle match surface can be reduced to a minimum of 12 mm with the new funnel mechanism and the low profile plenum chamber. This distance was previously limited to 40 mm. The minimum distance between the baffle match and plenum match is 25 mm when operating the new funnel mechanism with the existing plenum chambers.
11. **Performance Characteristics**  
The following graphs show a comparison between the previous and the new funnel mechanisms. Measurements are based on a basic equipment configuration, at full operating speed.

12. **Upstroke Cushioning**  
As this piston rotation diagram shows, there is a significant improvement in upstroke cushioning. The graph for the new mechanism depicts clearly that when the piston approaches the end position of the upstroke, the funnel arm comes to a smooth stop. This improvement permits funnel mechanism operation at higher speeds, without restricting performance.

13. **Speed Increase**  
The piston stroke diagram shows clearly that the new funnel mechanism is significantly faster compared to the previous design. Downstroke time can be reduced up to 52% and upstroke time up to 48%. The speed increase is achieved due to the new motion profile and improved speed and cushion control.
14. **Availability**
As of August 1996, funnel mechanism series 210-220 will be supplied standard on the following machines:

Phased-out mechanisms will no longer be manufactured after September 1996. Only the new funnel mechanism will be commercially available after this date. Wear parts of the replaced mechanisms will be supplied until the end of 1999.

<table>
<thead>
<tr>
<th>Funnel</th>
<th>Machine Type F &amp; EF &amp; AIS</th>
<th>Configuration</th>
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<tbody>
<tr>
<td>210-220</td>
<td>EF 5 ½</td>
<td>SG &amp; DG 5 ½”</td>
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<tr>
<td></td>
<td>F 5 ½</td>
<td>SG &amp; DG 5 ½”</td>
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<tr>
<td></td>
<td>F 6 ¼</td>
<td>SG &amp; DG 6 ¼” &amp; TG 4 ¼”</td>
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<td></td>
<td>AIS</td>
<td>DG 6 ¼” &amp; TG 4 ¼”</td>
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15. **Installation Requirements**

**Mounting on F + EF Machines (DG 5½)**
No modification for installation of the new funnel mechanism is required due to centering rings 23-5044 or 23-6777. Standard mold and funnel arm equipment can be used.

**Mounting on F + AIS Machine (DG 6¼” & TG 4¼”)**
The new funnel mechanism is installed in the section frame by means of centering ring 23-8875. The air supply piping must be modified according to the drawing 210-712 for previous funnel mechanism types only in the case of air-assist upstroke. The operating air supply piping for the airassist upstroke must be completely removed. The respective connections on the installed funnel operating air valve must be plugged, and the speed control screws fully opened. Operating air piping for the downstroke can be used for the new funnel mechanism. Make sure that the air inlet connection into the funnel cylinder head is made from the top. In this case, the existing 5/2-way funnel valve can be used.

16. **Operating air pressure**
EF & F 5½/2: The operating air at 2.1 bar for the EF 5½ machine is routed through the frame and into the mechanism via the centering ring. The funnel is actuated by means of the valve located on the valve block.

AIS & F: Operating air pressure at 3.1 bar is supplied to AIS and F type machines with mold center distances of DG 6½” and TG 4½”. The valve for the funnel mechanism is located on the overhead manifold and is actuated by the valve block. Operating air is routed from the valve and is connected to the cylinder head of the funnel mechanism.
17. **Pantograph Baffle Arm 210-208-3 / 210-207 / 210-214**

Pantograph Baffle Arm 210-208 must be installed in conjunction with the new funnel mechanism. Baffle holders are listed under 210-207, and details for machine conversions are given in 210-214. Please refer to the drawings mentioned above or see Technical News Bulletin 33 for detailed information on the Pantograph Baffle Arm and Technical News Bulletins 31 and 32 regarding the Baffle Mechanism.

18. **Low Profile Plenum Chamber 191-9152 Group 35 to 40**

New low profile plenum chambers with a recessed lock are available for blank side Verti-Flow for improved cooling of the baffle end of the blank mold. Please refer to the drawing 191-9152 for specifying the appropriate plenum chamber.

The new low profile plenum chamber will become the new Emhart standard for the future.

19. **Funnel Mechanism Features and Benefits**

**Features**
- New, improved cam design and cam roller fixation
- Enlarged air passages
- Easily accessible ball check valve
- Permanent lubrication
- Optimized upstroke cushioning
- Precise mechanism movement
- Improved pneumatic behavior
- Improved cooling of the baffle end
- Compatible with previous F + EF & AIS funnel mechanism

**Benefits**
- Faster upstroke by 48%
- Less mold equipment wear
- Improved container quality
- Greater maintenance convenience
- Compatibility with existing mold equipment
- Prolonged mechanism service life
- Reduced inventories for mechanism and spare parts