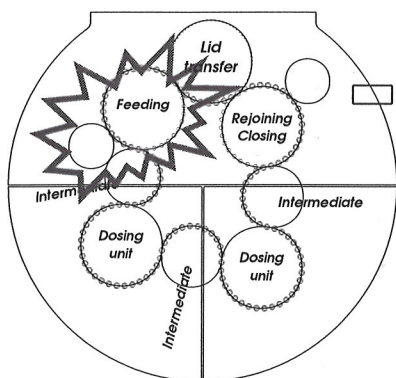


8.1 Infeed, positioning, opening unit



Closed empty capsules are inserted in the production cycle manually or by the customer's centralised infeed systems or by automatic devices supplied by MG2.

This unit also **inserts** the empty capsules and **vertically positions** them with the body below.

The unit consists mainly of:

- **Infeed hopper**
- **Capsule infeed tubes**
- **Tube support sectors**
- **Lips**
- **Positioning drum sectors**
- **Capsule opening ring**
- **Capsule support and positioning blades**

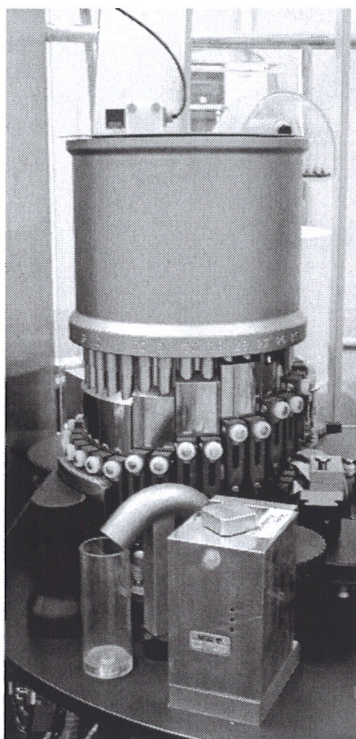
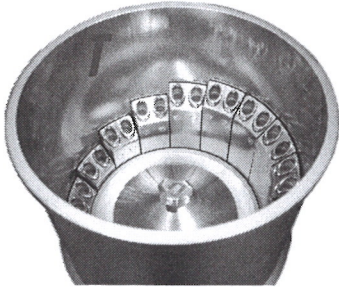


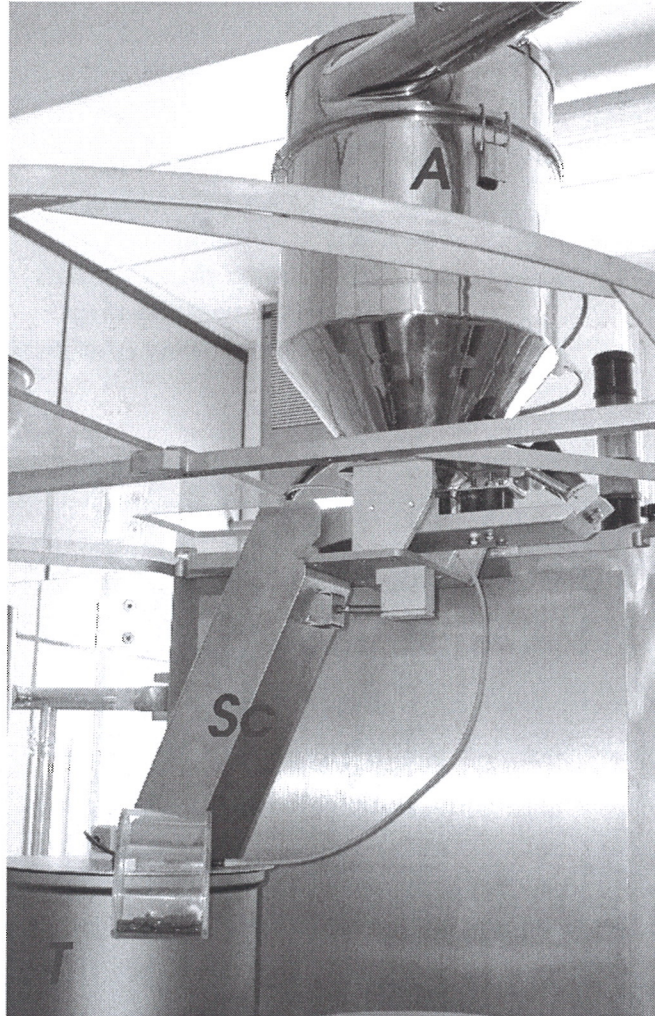
Figure 22 – The photo shows the inside and outside of the infeed hopper **T** with the infeed tubes highlighted.



Capsule infeed

As has already been mentioned capsule infeed can be done manually by the operator or by an external automatic infeed system.

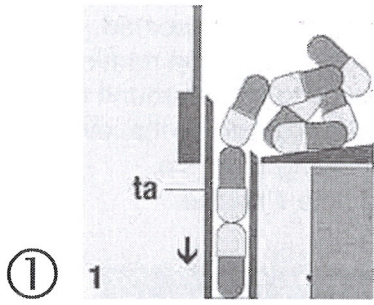
The pre-closed capsules are transferred from above. They descend from the infeed system **A** into the infeed hopper **T** or holding drum (see the photo at side). They descend by means of a vibrating hopper with chute **Sc**.



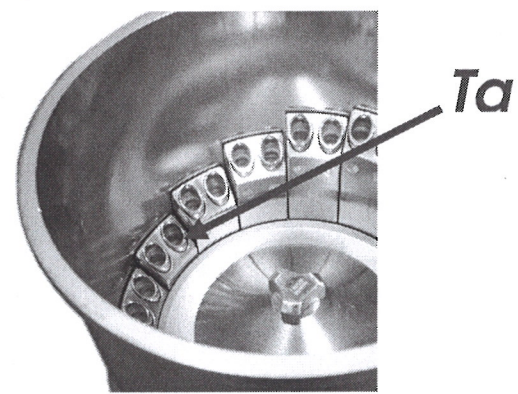
Functional description

The **hopper** and **infeed tubes** rotate at a constant speed around the hopper axis.

The tubes also have an alternating vertical motion: a **cam** (see arrows in photo below) impedes the rotation of the tubes by forcing them to make alternate vertical movements upwards and downwards.

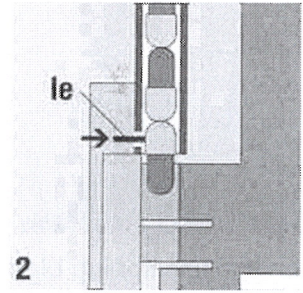


When the tubes descend, the capsules are conveyed from the infeed hopper into the tubes **Ta** and are positioned vertically with the body randomly positioned upwards or downwards.

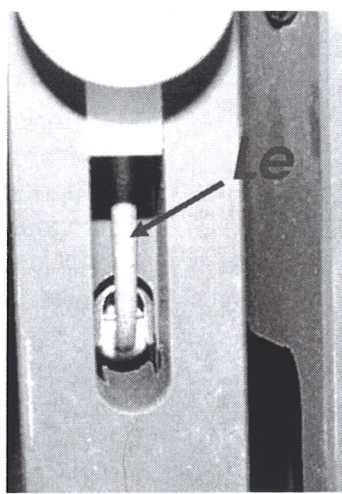
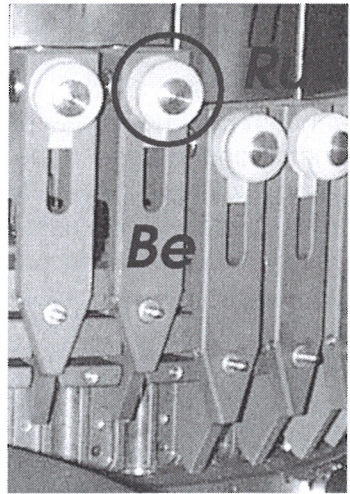
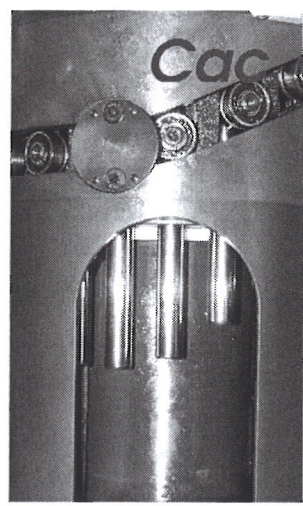


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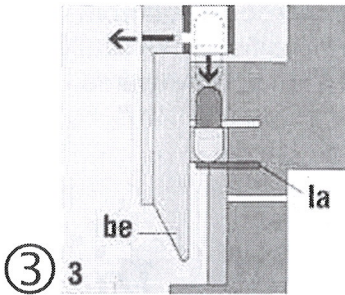
②



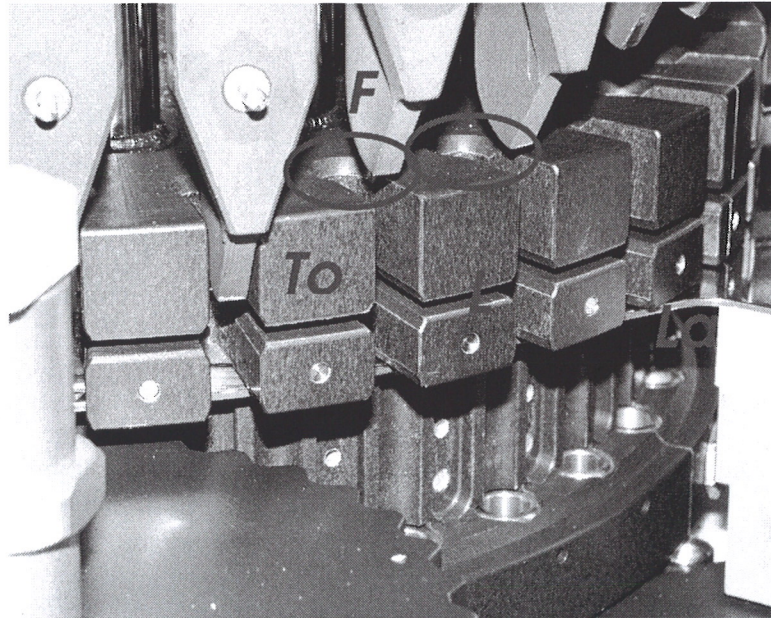
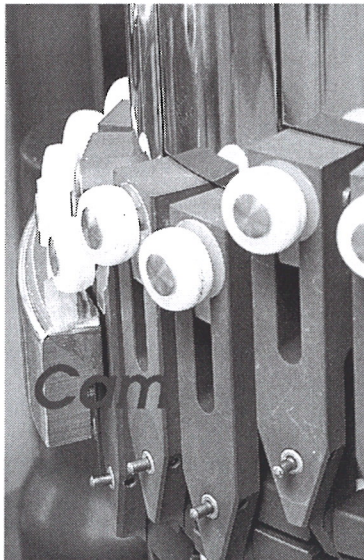
The capsules drop inside the tubes by gravity. Their descent is stopped by the small levers **Le**. These levers are secured to the rollers **Ru** fitted inside the lips **Be** (see the photograph below and the diagram alongside).



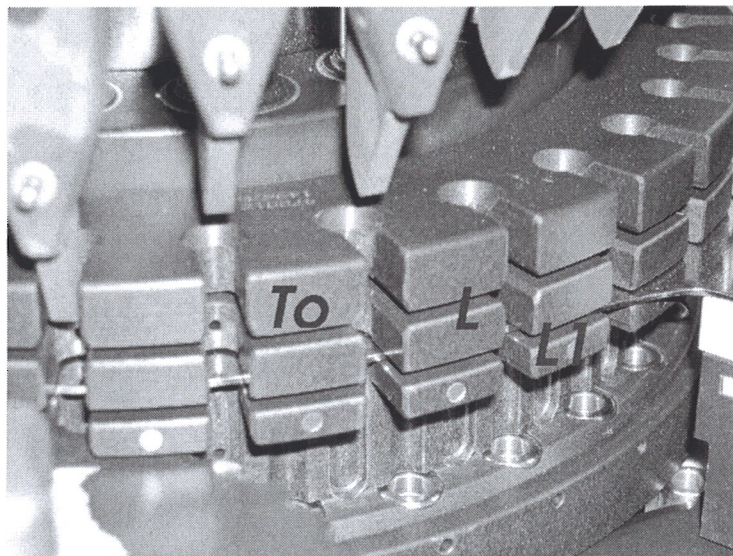
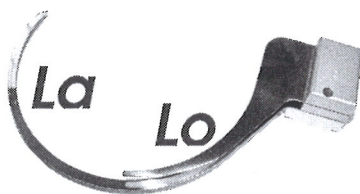
The rollers slide on the **capsule release Cam**. The tubes and lips are also forced to descend by the **capsule infeed cam Cac** located in the part of the unit below the machine surface (see the photograph below).



During roller movement, the **capsule release cam**, located externally to the unit on the machine deck, causes the rotation axis of the rollers and the relative levers **Le** to move around the fulcrum. This frees the capsules that were blocked by the levers enabling them to descend into the positioning drum **To**. The capsule passes inside a calibrated hole **F** on the positioning drum.



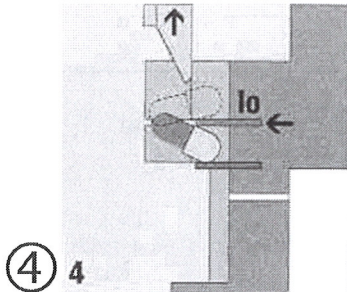
There is a notch **L** in the hole to position the positioning blade **Lo** and a notch on the edge of the positioning drum for the support blade **La**. There may be two notches, depending on the capsule size handled; in this case, the support blade **La** positions itself in the second notch **L1** (see photo below).



The notches create one or more bands on the positioning drum.

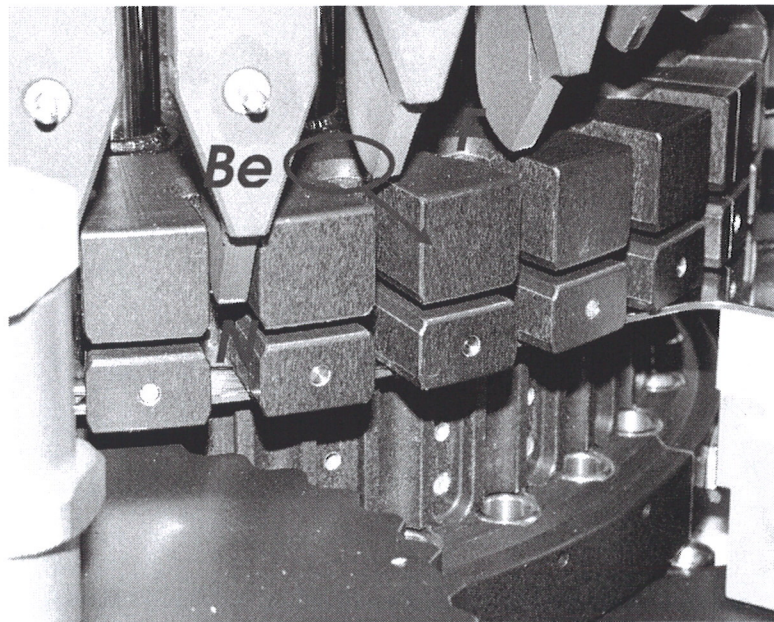


NOTE: For 000, 00L, 0L capsule sizes the L1 notch are not present. For this reason the support blade is not inserted in the relevant notch but under the drum.



When the capsule meets the positioning blade **Lo** it is pushed towards the outside of the drum **To**. See the diagram at the side.

Each hole **F** has an opening **N** whose calibrated width is greater than the diameter of the body and less than the diameter of the lid (see the diagram below).



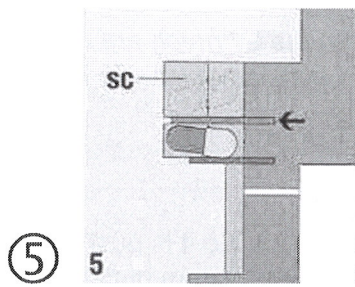
As the lips **Be** begin to move up, the positioning blade **Lo** pushes all the capsule bodies towards the outside of the drum **To** placing them in a horizontal position.

Given that the lid is larger than the body, the body always turns outwards as it revolves on the lid.

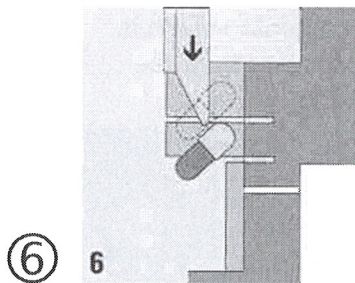
When the lid meets the opening **N**, since it has a larger diameter it is blocked and the body is forced to rotate towards the outside of the drum, keeping as centre of rotation the point in which the lid was blocked in the opening **N**.

Those capsules with the lid uppermost maintain a centre of rotation at the height of the **upper band** on the positioning drum.

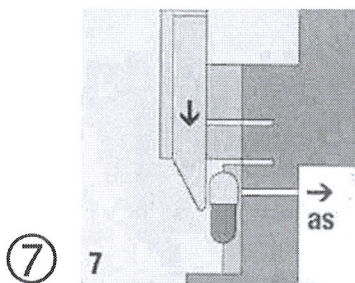
Those capsules with the lids downwards maintain a centre of rotation at the height of the **lower band**.



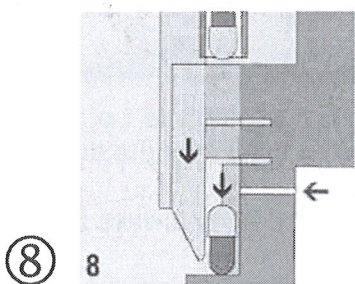
When this rotation is complete, all the capsules are horizontal, some at the height of the **upper band** and others at the height of the **lower band**, all with the lid facing in and the body facing out (see the diagram alongside).



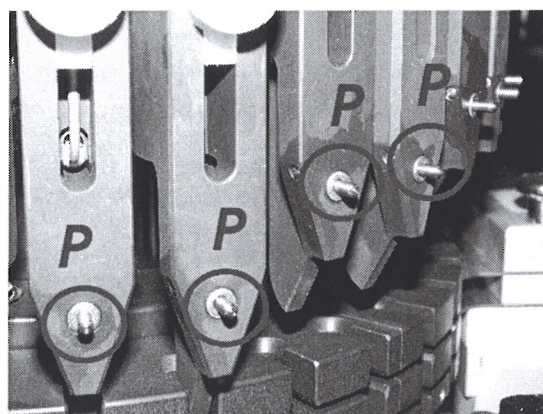
The lips move down again completing the rotation of the capsule which is positioned with the body downwards.



Suction **As** keeps the capsules in the positioning drum.

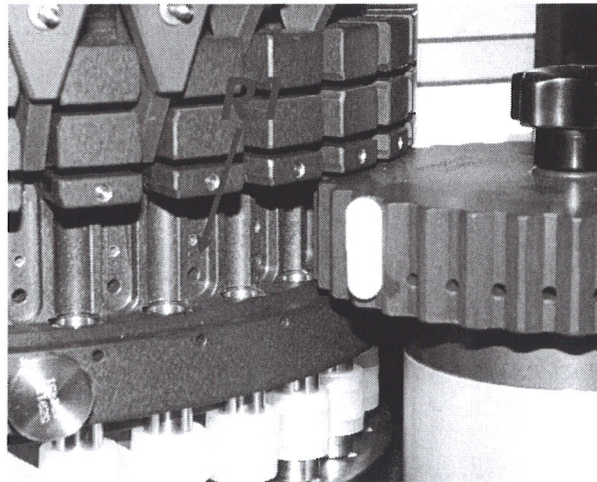


The lips continue to move down, the suction changes to a jet of air which separates the capsules. Now the capsules are free to descend into the seats of the lower drum. This transfer is enabled by the downward motion of the lips, which hold the capsules and simultaneously push them downwards using the sprung pins **P**. During this phase, the pins are pushed above the capsule lid by the forced descent cam.



The capsules are supported by the capsule opening ring **Q** and held there by the suction head **R1**.

The lips continue to move down, the suction changes to a jet of air which separates the capsules. Now the capsules are free to descend into the seats of the lower drum. This step is helped by the downward motion of the lips, which hold the capsules as they rest on capsule opening ring **Q** held by suction **R1**.



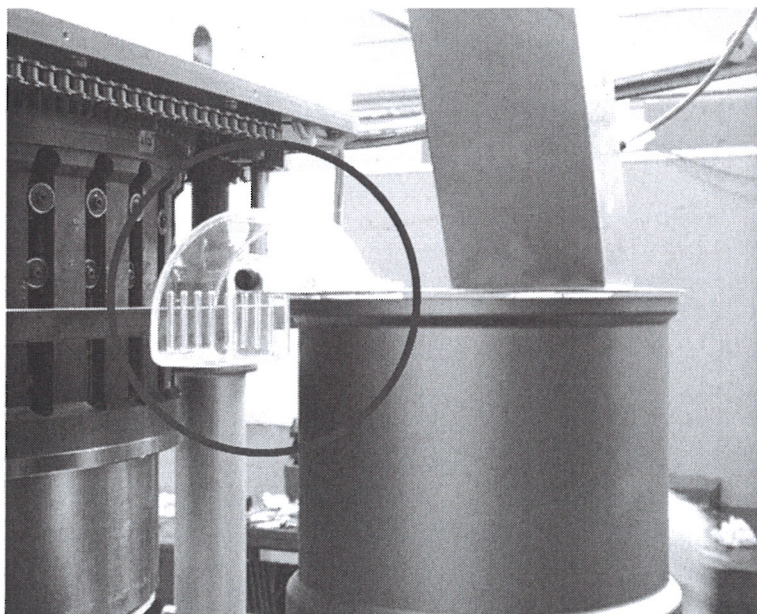
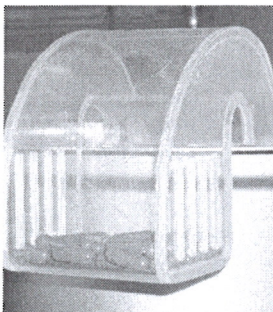
Infeed tube clearing device

The pre-assembled empty capsules fed into the rotating hopper can sometimes be defective (deformed).

In this case, they may obstruct the tubes as they descend.

The infeed tube clearing device makes it possible to automatically clear the obstructed tube with a jet of compressed air. Capsules removed in this way are collected in a container.

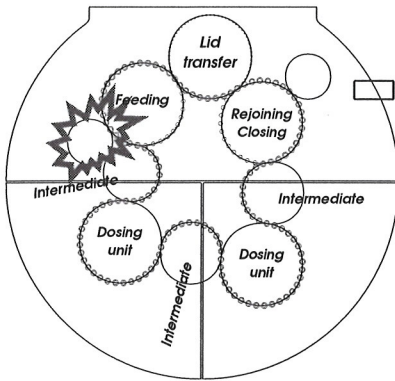
Figure 23 – The photo shows the infeed tube clearing collection container.



The system lets you free the obstructed tube without stopping the machine, but just slowing the speed. If the system is unable to free the obstructed tube after N preset attempts, the machine will stop and an alarm will be displayed on the monitor.

The message will tell the operator the number of the obstructed tube, which will have to be freed manually.

8.2 Capsule infeed transfer wheel

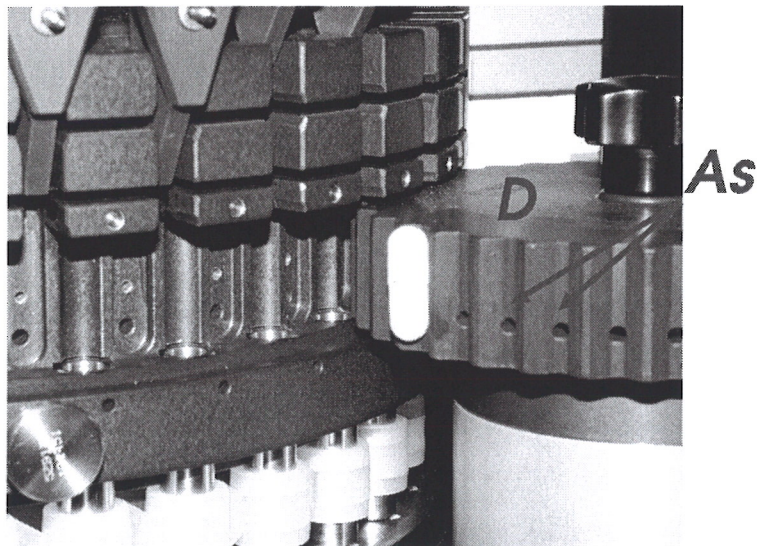


This wheel is connected to the infeed unit. It collects the unopened positioned capsules and then returns them in phase to the same unit for opening.

This transfer wheel has the capsule presence sensor or the ECCS sensor of the NETT system NETT (OPTIONAL).

Functional description

Once the capsules are positioned, they arrive in the zone where air jets and suction transfer them to the **capsule infeed transfer wheel D** which holds them in the housings by suction **As**.



The capsules then move in front of a **ECCS** sensor to detect presence and enable the tare to be calculated for each capsule.

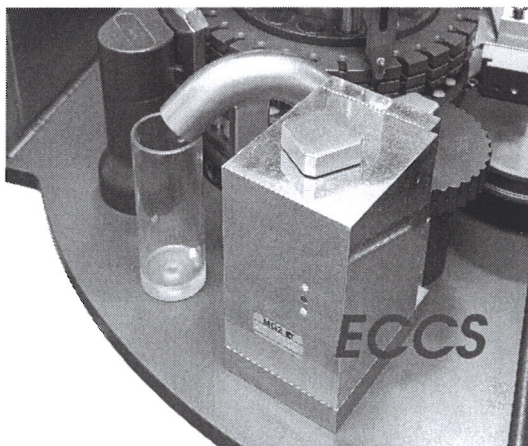
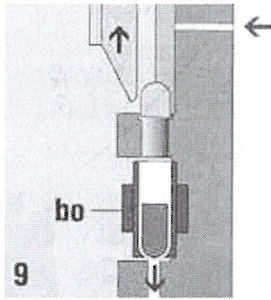
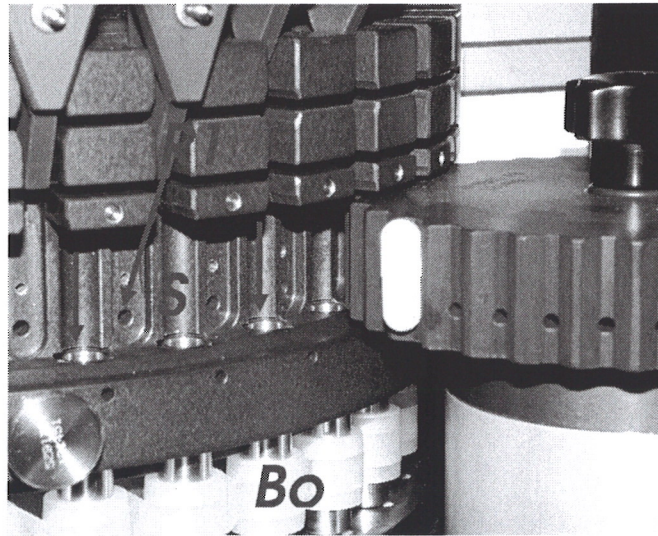


Figure 24 – The photograph shows the ECCS sensor

⑨

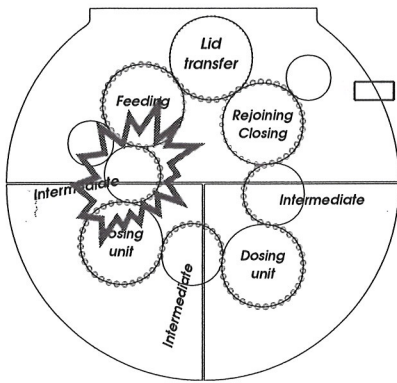


The capsules then return to the infeed and positioning unit where they are opened. The capsules are transferred to the capsule opening ring, not to the seats where they were held previously by the suction head *R1*, but in line with the hole *S* on the opening drum (see the photograph below). The size of the hole allows the capsule bodies to pass but not the lids. A strong vacuum generated by the vacuum pump pulls the bodies downwards. The bodies descend inside the body support bush *Bo*.



The lids, blocked by a narrowing of the hole *S*, remain at the base of the capsule opening ring. The vacuum causes the bodies to fall inside the transfer belt bushes. The bodies are then transferred towards the body transfer unit *B*, whilst the lids are transferred to the lid transfer unit.

8.3 Body transfer unit



This unit consists mainly of a non-motorised wheel (idle intermediate) connected to the infeed unit. The wheel transfers the capsule bodies contained inside the transfer belt bushes.

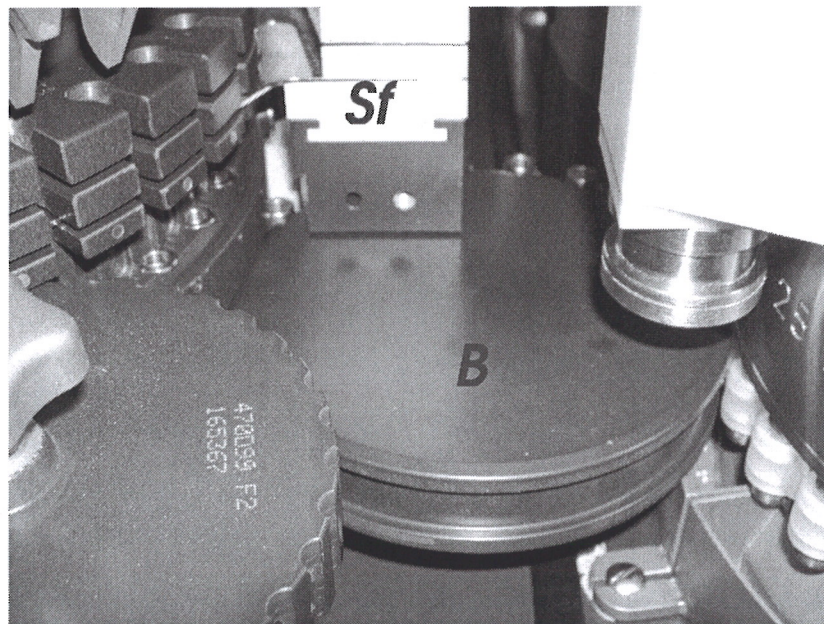
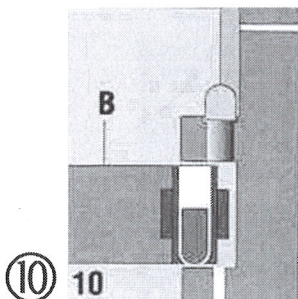


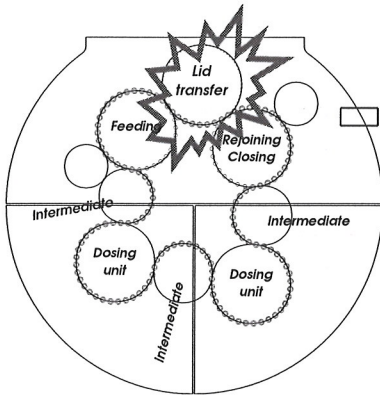
Figure 25 – Body transfer unit with blade support block and incorporated body presence sensor.



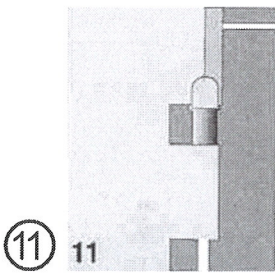
The capsule bodies are transferred to unit **B** (idle intermediate) where the body presence sensor (unopened capsules) **Sf** located on the blade support block detects their transfer. The bodies are then transferred by the conveyor belt to the dosing unit which is divided into two stations **C+E**.

In case of pre-set number **n** of consecutive missing bodies, the machine will be stopped and an alarm will be displayed on the monitor.

8.4 Lid transfer unit



This unit consists mainly of a non-motorised wheel (idle intermediate) connected to the infeed unit. The wheel **transfers the capsule lids** to the closing unit.



This unit consists mainly of a wheel (idle intermediate) (H) which collects the capsule lids from A thanks to the combination of suction and air jets. The unit then transfers the lids, under suction, to capsule closing unit G.

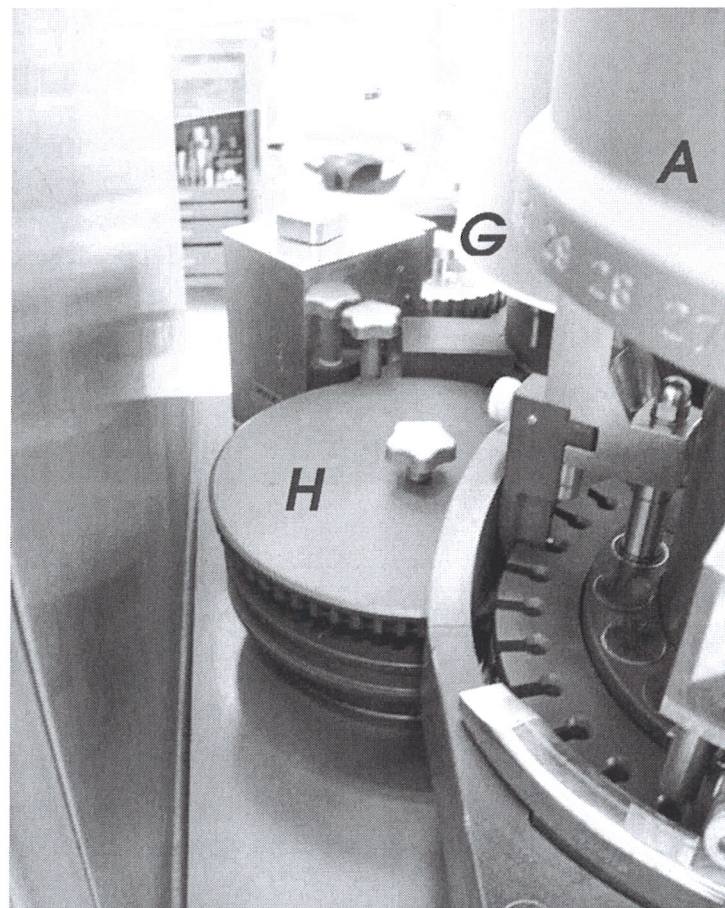
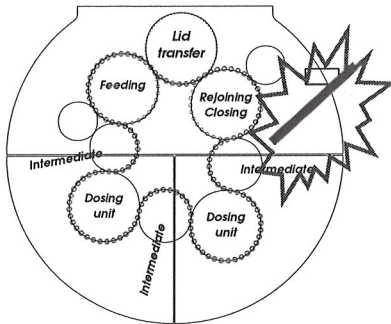
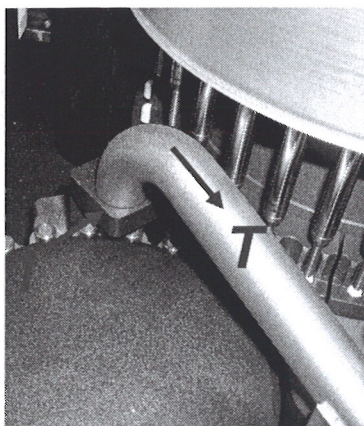
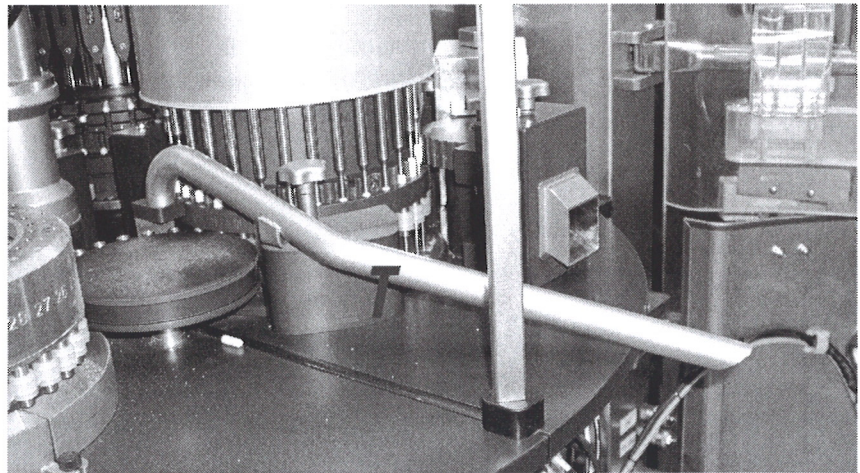


Figure 26 - The photo shows the lid transfer unit.

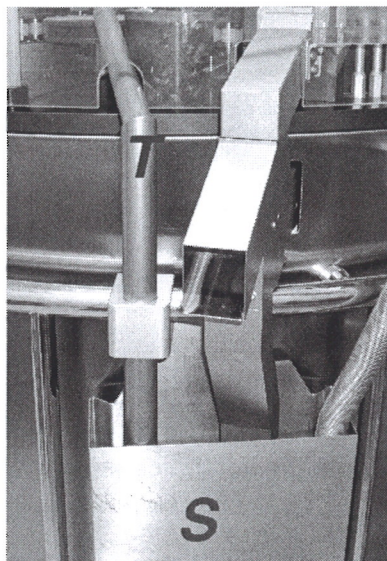
8.5 Closing unit capsule rejection device



This device enables the rejection for the capsule bodies without lids before the rejoining and closing phases. Actually when the system detects a capsule lid missing it send a signal to this rejection device that rejects the relevant capsule body. The rejection device is positioned in the intermediate wheel before the closing unit.

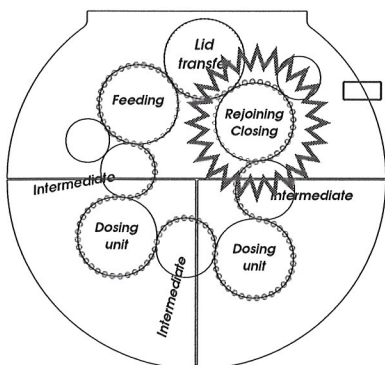


The rejection is performed in the intermediate wheel that transfers the capsule body to the closing unit. The body to reject is removed from the bush of the transfer belt by means an air jet **1**. The body and residual product is conveyed into the hose **T** towards the external **S**.



In practice this rejection device doesn't substitutes the exit rejection device but anticipating the body rejection maintains more cleaned the machine deck and the machine production exit zone.

8.6 Closing unit (joining and closing)



In this unit, the dosed bodies are joined to their lids and **are re-assembled on their lids**. Then **the capsules are closed** and transferred to the outfeed wheel. The unit consists mainly of:

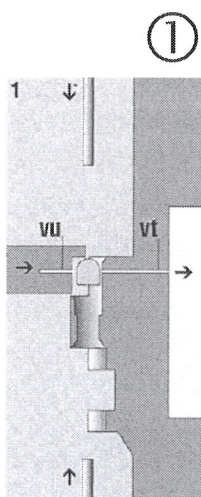
- **Closing sectors**
- **Capsule closing contrast pushers**
- **Capsule closing pushers**
- **Pusher movement cam**

The closing unit **G** rejoins the specific capsule body, separated from its lid in the infeed unit, with the lid in question.



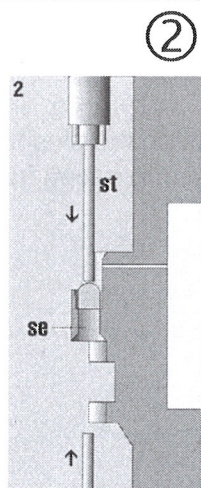
Functional description

When the body carrier bush is aligned with the plate seat of the corresponding lid, the capsule is closed by contrast and closing pushers.



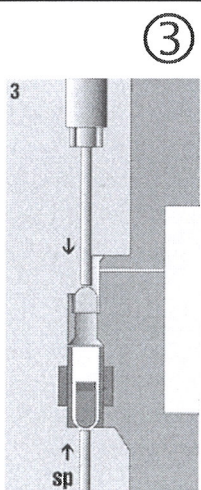
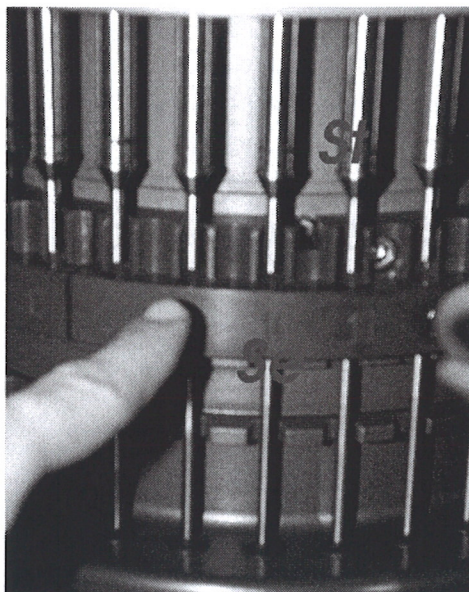
①

Initially the capsule lids are picked up by vacuum from the lid transfer unit and transferred to the capsule closing unit closing sectors.



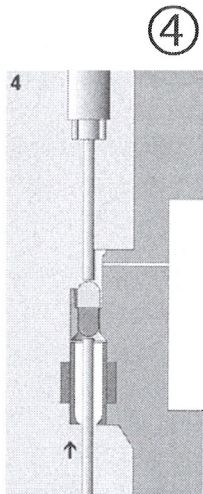
②

The descent of the contrast pushers **St** conveys the lids into the seats on the closing sectors **Se**.

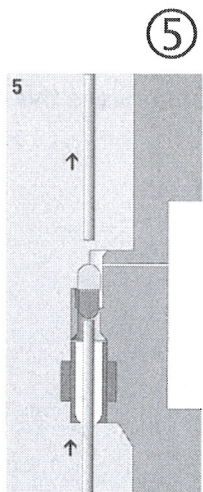


③

The capsule lids inside the seats on the closing sectors are aligned with their bodies held in the transfer belt bushes.



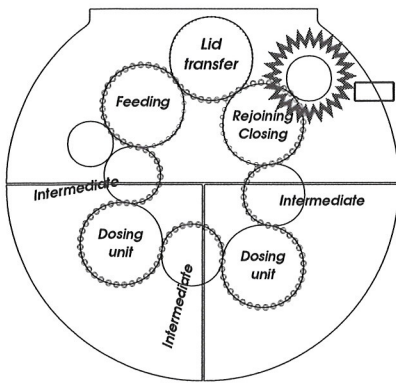
The closing pushers **Sp** move up and push the capsule bodies into the lids which are held firm by the contrast pushers, thus closing the capsules.



The contrast pushers then move up at the same time as the closing pushers. This causes the capsules to be pushed out of their seats on the closing sectors.

Once the capsules have left their seats on the closing sectors, they are picked up by vacuum originating from the capsule outfeed transfer wheel.

8.7 Capsule outfeed transfer wheel



This wheel picks up the closed capsules from the closing unit and transfers them toward the production outfeed. Good capsules, bad capsules, and those that the system was unable to check are selected in this zone.

The unit consists mainly of:

- **Transfer wheel L**
- **Dosed capsule weight check sensor FCCS (OPTIONAL)**
- **Capsule outfeed presence sensor Se**
- **Ejection air jet nozzles Ug**

The closed capsule is transferred to wheel **L**. There is a fourth capsule presence sensor **Se** located before outfeed chute **V** to detect dosed capsule presence. The capsules are then transferred to production outfeed.

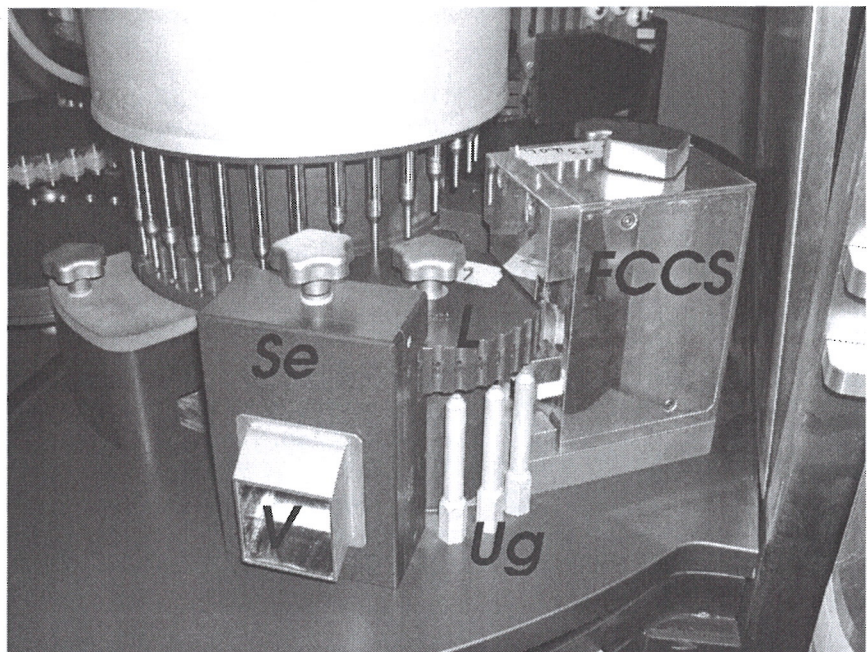
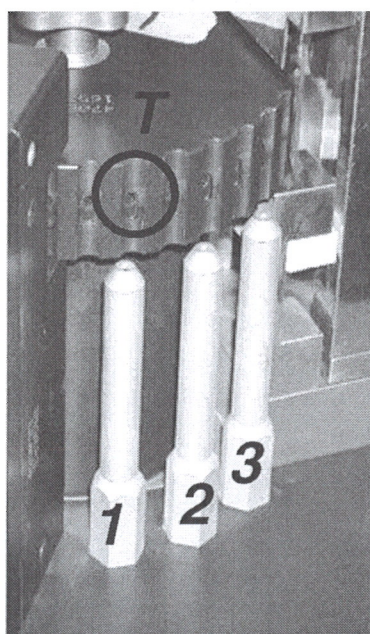
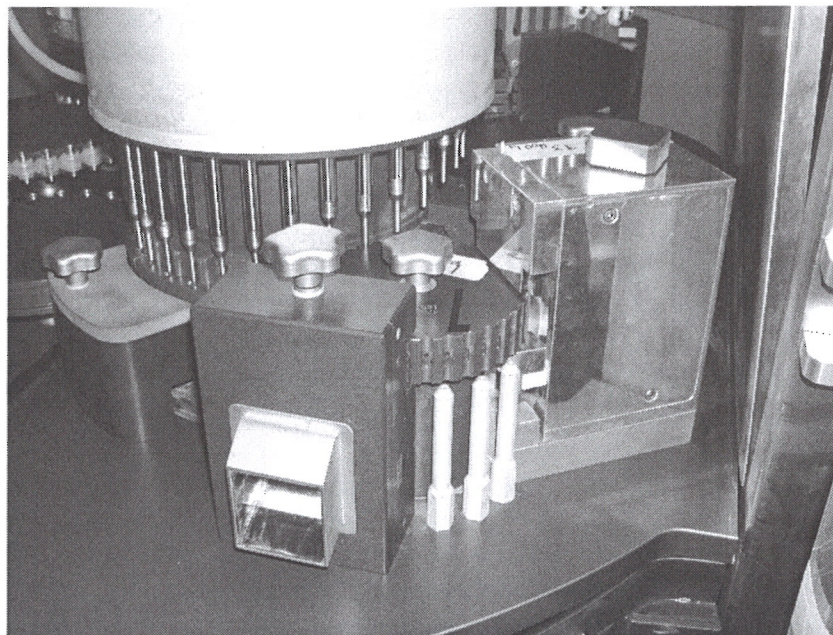


Figure 27 - The photograph shows the capsule outfeed transfer wheel with the reject capsule air jets (**Z**), the capsule outfeed presence sensor (**Ug**) and the production outfeed chute (**V**).

Functional description

The closed capsules are transferred to the outfeed transfer wheel **L** by a vacuum and air jets.

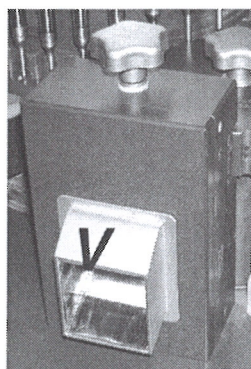


The wheel has a series of notches **T** in line with the suction holes to hold the capsules at an equal distance from one another.

Air jets **1, 2, 3** are located before the capsule production outfeed chute to deflect the capsules to the various outfeed chutes.

If the machine is fitted with the **NETT** weight control system, the dosed and closed capsules are transferred in front of the **FCCS** sensor to enable the gross weight to be calculated for each capsule.

This data, plus the measurement taken by the **ECCS** sensor, is elaborated by the weight check system to calculate net content.



Capsule production outfeed

If a capsule is correctly dosed, it reaches the production outfeed chute.

A slanting block detaches the capsule and causes it to drop onto chute **V** and into the production container.

The capsule presence sensor checks that capsules that should have been rejected are not still in the wheel and have not reached production outfeed.

If a reject capsule is detected at production outfeed, the machine is stopped and a corresponding warning message displayed on screen.

Outfeed of capsules to be sampled (NT)

The system lets you collect a sample of capsules to manually check weight using an off-line balance.

Bad capsules

The system lets you eject capsules for which the weight check system reveals the wrong weight.

They are rejected before they are fed out from the production cycle. The machine control system transmits a pulse to a solenoid valve which enables an air jet to eject the capsule before it reaches the outfeed chute.

The capsules which the **NETT** system has failed to detect are also rejected.

Thus, **under-dosed** and **over-dosed capsules** are transferred to the reject capsule container.

If the machine is fit with the capsule colour detection system (**COLOUR SENSOR**) or the **LID PRESENCE** sensor, the capsules rejected by one of these devices are conveyed to this outfeed.

Outfeed of capsules to be sent to the balance of the NETT system

By checking the weight of sample capsules, the weight check system automatically sets the two weight check sensors ECCS and FCCS (in the capsule infeed unit and capsule outfeed unit) and automatically adjusts the dosing parameters.

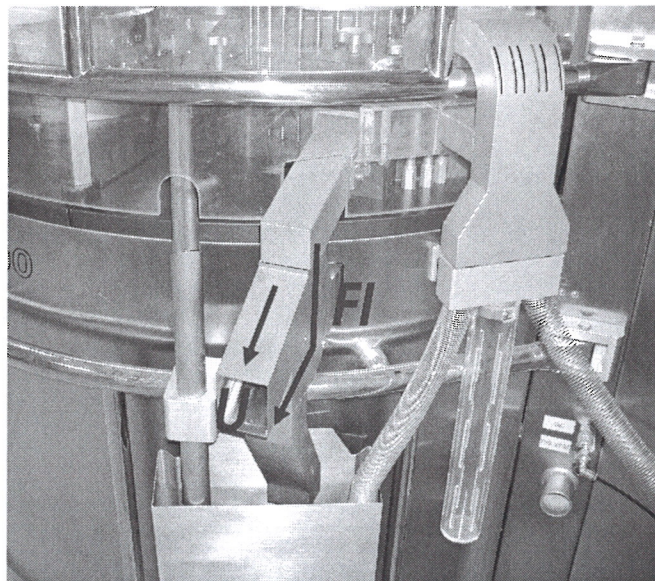
8.8 Production outfeed and capsule reject flap

The dosed and closed capsules are transferred along the outfeed chute which is fitted with a flap to manage rejects.

The flap is a device used to eliminate reject capsules from the control system by intercepting the closed capsule flow before the capsules leave the capsule outfeed chute and transferring them to a collection container.

If a capsule is correctly dosed, it reaches the production outfeed chute **U**.

There is a flap on the outfeed chute to eliminate the reject capsules **FI** (see photo below).



This device eliminates the reject capsules by intercepting the flow of closed capsules before the production outfeed chute. The capsules are transferred into a collection container.