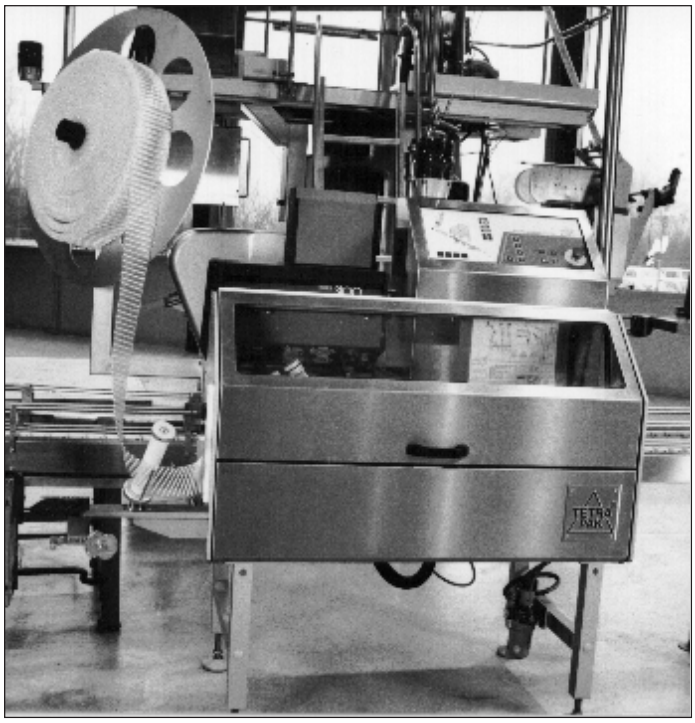
Machine description

Tetra
Straw Applicator 36



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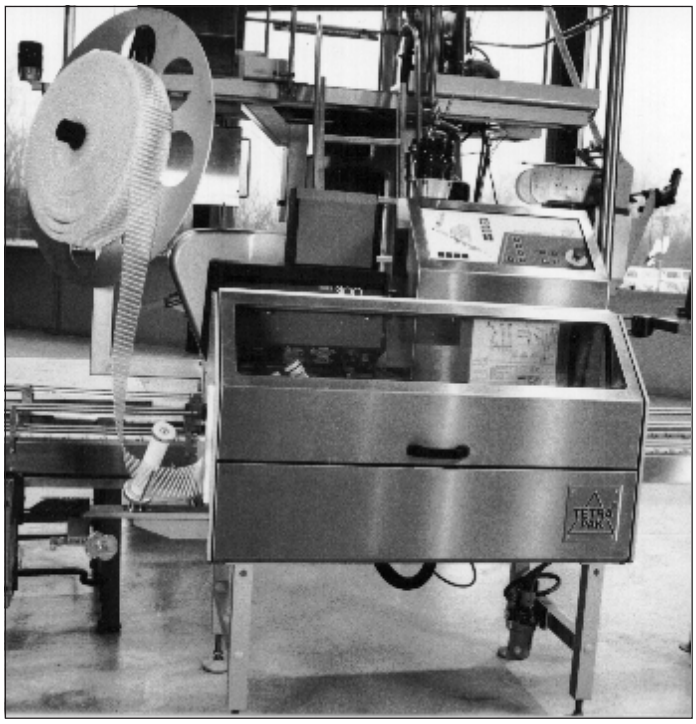

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Tetra Straw Applicator 36

General

The Tetra Straw Applicator 36 is used to attach drinking straws to Tetra Brik packages.

The machine can be used for package volumes between 100 and 500 ml, and it has a capacity of 6000 packages per hour.

The machine is easily convertible for different package volumes and types of drinking straws. It has a programmable control system for all its functions.

Transportation

The package are carried from the packaging machine and through the straw applicator by a conveyor, which is driven by means of an external drive unit, installed after the machine.
As the packages are fed into the machine, they are separated by a package brake.

Hot melt adhesive

After the brake, the packages pass a photocell, which causes the hot melt guns to be activated. The guns apply molten hot melt adhesive to the packages in the form of dots, whose position is determined by the control system of the machine.

Depending of what type of drinking straw to be attached, two or three dots of adhesive are extruded on each package.

Drinking straws

The drinking straws are held in a plastic straw ladder, in which they are evenly spaced. The plastic straw ladder is reeled up on a bobbin. The types of straws that may be used are designated F, S, T, and U straws.

When the dots of adhesive have been extruded on the package panel, the drinking straw is to be attached. This is done by the package activating a photocell, located at the applicator unit of the machine. As the photocell is activated, a stop plate moves out to hold back the package. The applicator unit feeds forward, cuts off the drinking straws, and attaches them to the packages.

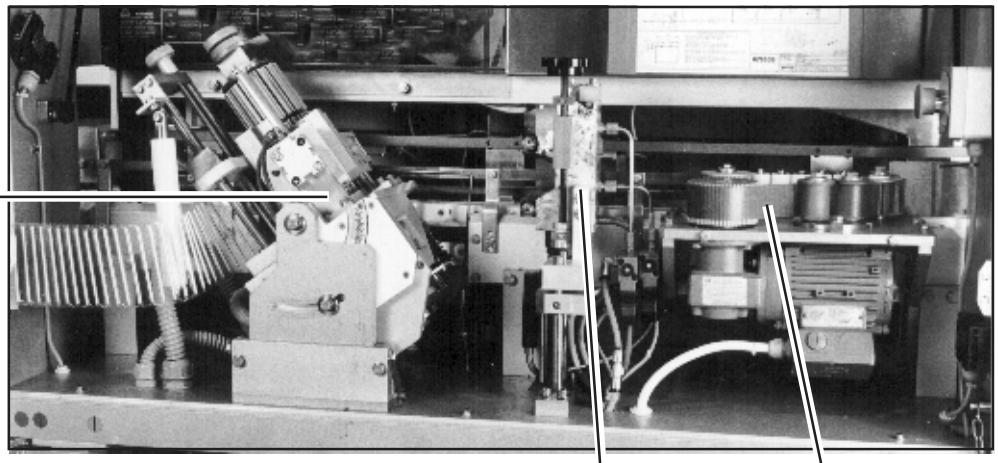
Applicator unit

The applicator unit feeds forward; a section containing one straw is cut off thestraw ladder and attached to each package.
As soon as the straw has been attached, the stop plate is withdrawn, and compressed air is blown against the back of the package to make it travel on.

When F type drinking straws are applied, a separate device is installed in the discharge section of the machine. This device consists of two driven timing belts, over which bending and forming rollers are fitted. These rollers perform the final positioning and attaching of the top part of the drinking straw.

Discharge

After these operations, application has been completed, and the package is conveyed onwards.
Optionally, the machine can be constructed for straight discharge or so that the packages are discharged on the same side as they were fed into it. In the latter case, a 180° wheel curve is installed after the machine, and the packages are then taken once more through the machine on their way out.

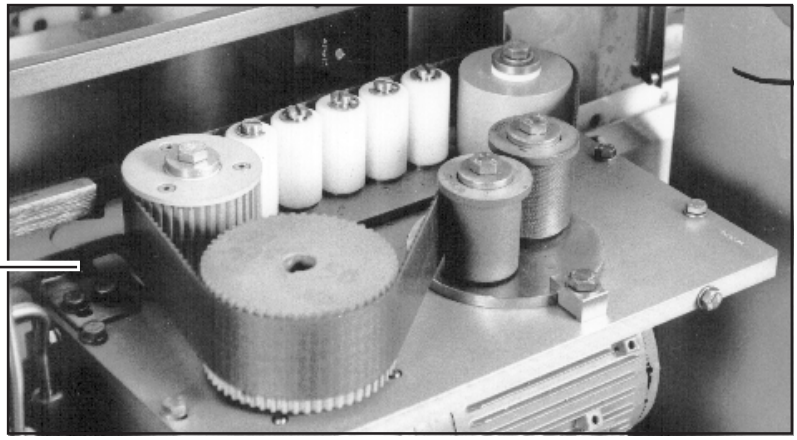


Front view of machine

Feed

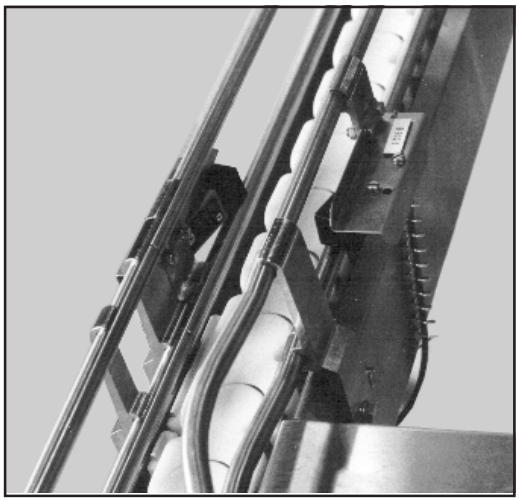
Feed brake

The packages arrive on the conveyor from the packaging machine to a feed brake. This brake consists of a timing belt driven by an electric motor via a worm gear. The packages pass between the timing belt and two guide rails. As the belt moves at a slower speed than the conveyor, the packages will be separated when leaving the brake. The gear wheel on the output shaft of the worm gear may differ for different package volumes. During production, the feed brake operates continuously. After the brake, there is a short guide rail to ensure that the packages are straight on the conveyor.



Feed brake

In case an external package brake is installed on the conveyor before the machine, the feed brake will stop if no packages have reached the machine in the span of 30 seconds. One photocell pair (the one closest to the machine) belonging to the external brake is employed to restart the brake. As these photocells sense the presence of packages, the brake starts. This function is incorporated in the program of all machines of this type.

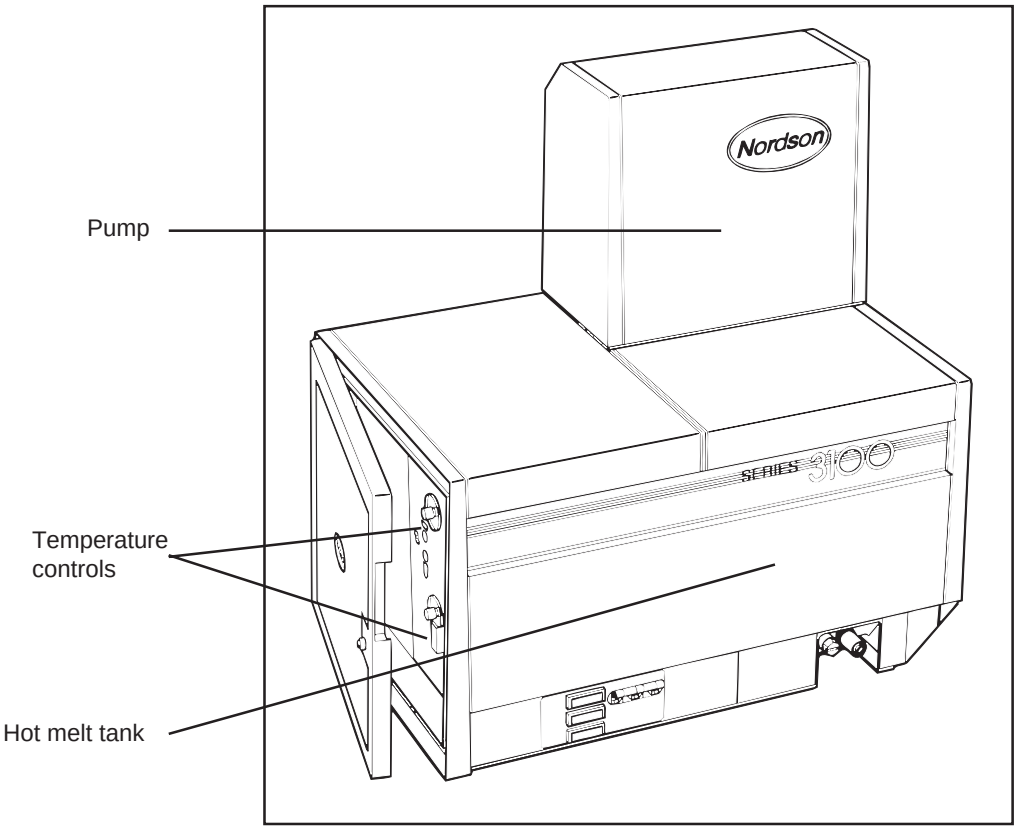


Forward photocells of external brake

Hot melt adhesive

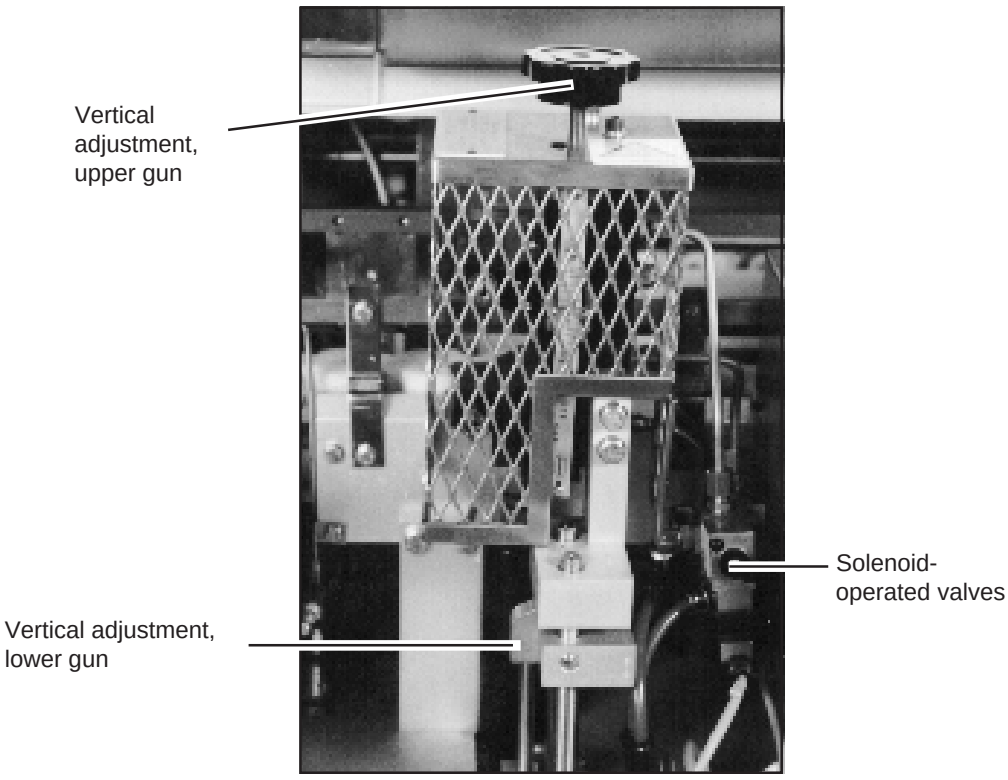
The drinking straws are attached by means of dots of hot melt adhesive, extruded on the packages. The adhesive is melted in a heated tank and pumped by a pneumatic pump through a hose to the extrusion guns.

The temperature in the various sections of the hot melt unit is controlled by its own control system. Temperature probes are fitted in the tank, hose, and guns, providing temperature information to the control system on the actual temperature values. The tank and gun temperatures are individually adjustable, while the hose temperature is related to either of these temperature values.



Hot melt unit

When the package is positioned in front of the guns, they are ”fired” by means of solenoid-operated pneumatic control valves, and dots of hot melt adhesive are extruded on the package. The horizontal position and the length of each dot is determined by the control system of the machine. The vertical position is adjusted on the guns.



Hot melt guns

The amount of adhesive extruded can be adjusted by altering the air pressure to the pump. Two or three beads of adhesive are extruded, depending on type of drinking straw applied.

Hot melt adhesive application

Dot position

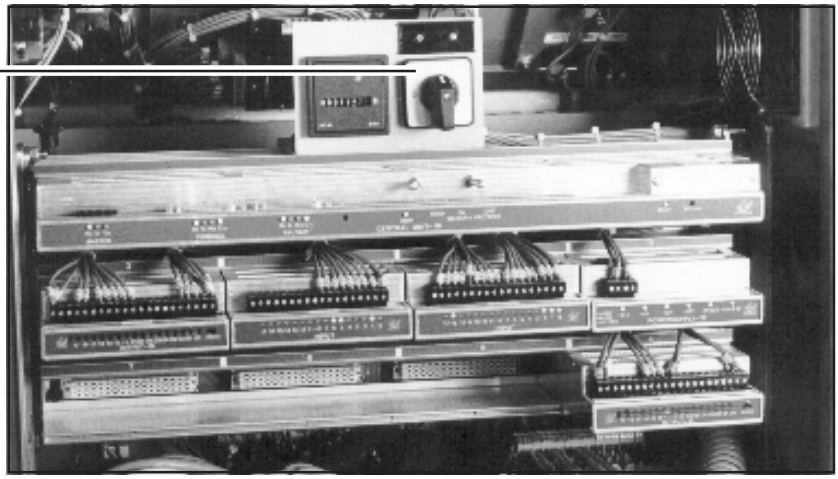
As the package leaves the feed brake, it is conveyored past a photocell, which initiates the application of the adhesive. This does not take place directly but is predetermined in the control system of the machine. The positions and lengths of the adhesive dots constitute values in the machine program. The values are related to the scan time of the control system; this time is always constant.

This method to control the application of adhesive presupposes that the conveyor runs smoothly and evenly without jerking at the preset speed. To achieve this, it is preferable that the drive unit after the straw applicator operates as short a conveyor as possible. If the conveyor speed turns out to deviate too much from the nominal value when the machine has been installed, the values in the program must be trimmed in order to arrive at the correct dot positions.

Program selection

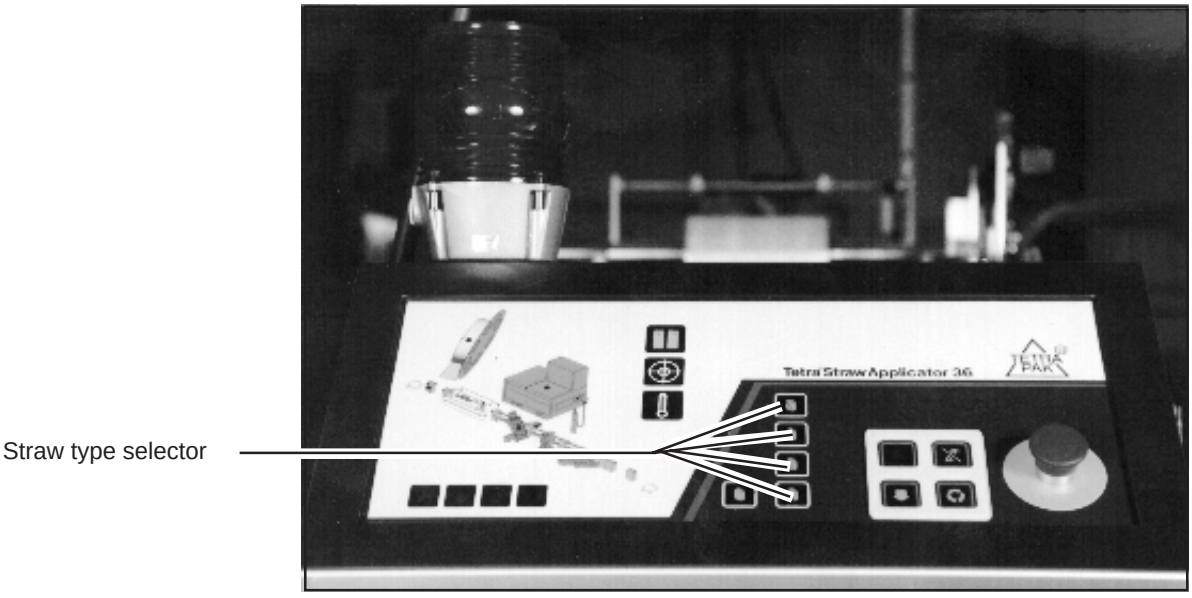
Depending on package volume and type of drinking straw selected, different control system values (data) are used.

On delivery, the machine is factory preset for the package volume it has been ordered to work with. Presetting is done by means of the program selector inside the electrical cabinet. If, for some reason, the machine is to be working with a different package volume, certain components must be mechanically reset and/or adjusted in addition to resetting the program selector.



Electrical cabinet (machine with TPMC system)

Type of drinking straw is selected by means of push buttons on the control panel of the machine. Neither program not type of straw can be changed during production.



Control panel

Drinking straws and straw magazine

Types of drinking straws

The various types of drinking straws that can be used in the machine are:

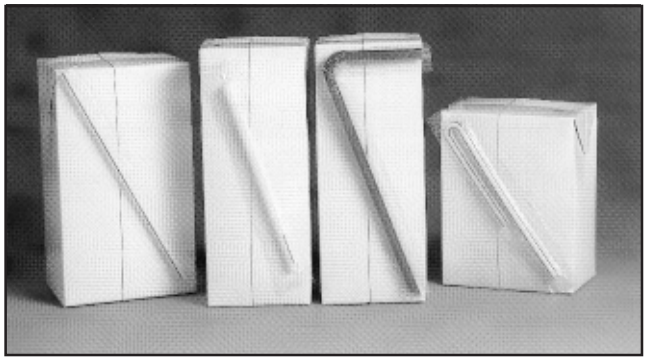
S = straight straw

T = telescopic straw (can be extended)

F = flexible straw (straw straight in plastic straw ladder but bent by ma chine on application)

U = bent to U-shape in plastic straw ladder

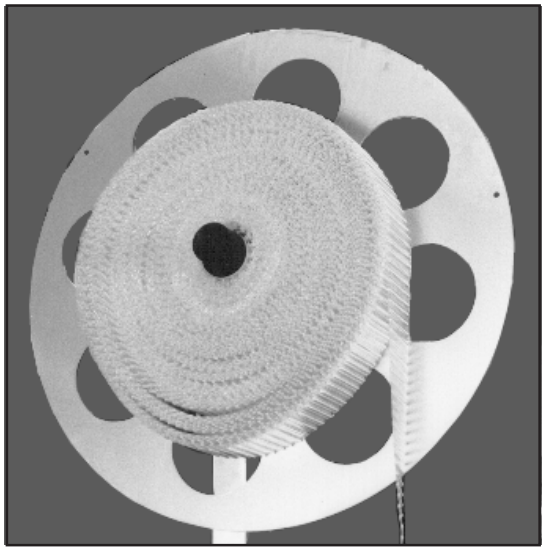
The drinking straws are encased and held at even gaps in a straw ladder of plastic, which is reeled up on a bobbin.



S T F U

Drinking straw magazine

Each bobbin holds 3000-8000 straws, depending on straw type and diameter. The machine is equipped with a bobbin holder, on which the bobbins are hung.



Drinking straw magazine

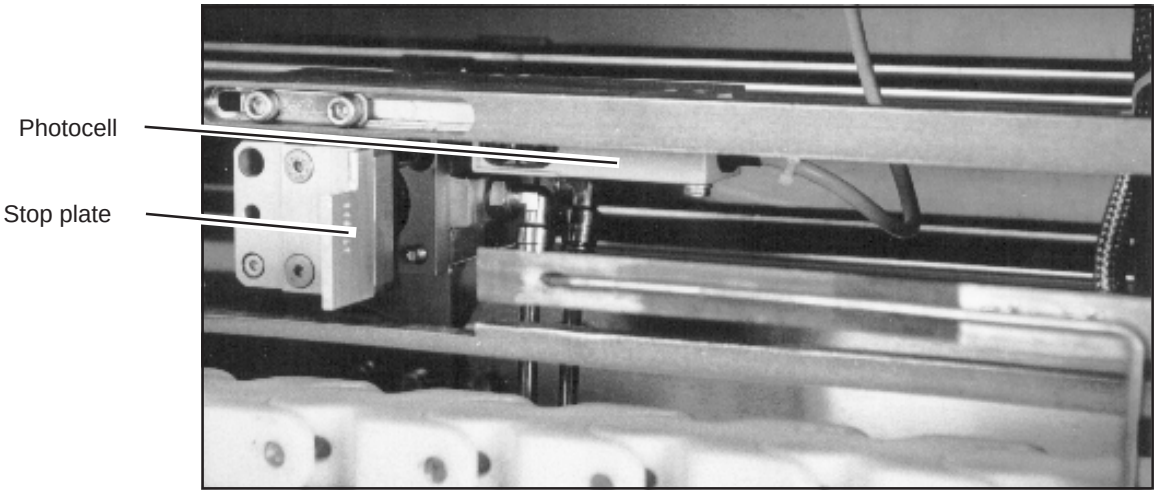
Type ”Megabox” drinking straw magazines are available as extra equipment. In these, the plastic straw ladder of straws is contained in a cardboard box, containing enough straws for approximately eight hours of production.

Applicator unit

Package stop

When the package has received the extruded adhesive beads, it is conveyord on to the applicator unit. Before reaching the latter, it actuates a photocell. This causes a pneumatic cylinder to move a stop plate across the conveyor, holding the package back.

The photocell and stop device are attached to the same plate, which can be adjusted to ensure that the straw will be attached in the correct position on the package. For the photocell, there are two alternative locations on the plate, which one to choose depends on the package volume.



Package stop

The applicator unit feeds the straws, cuts them off the plastic straw ladder, and attaches them to the packages. The applicator consists of a feed wheel, a cutter unit, and squeezers, all fitted on a housing. Inside the housing are the drives for the feed wheel and squeezer: an electric stepping motor for the feed wheel and a pneumatic cylinder for the squeezers.

Feed wheel

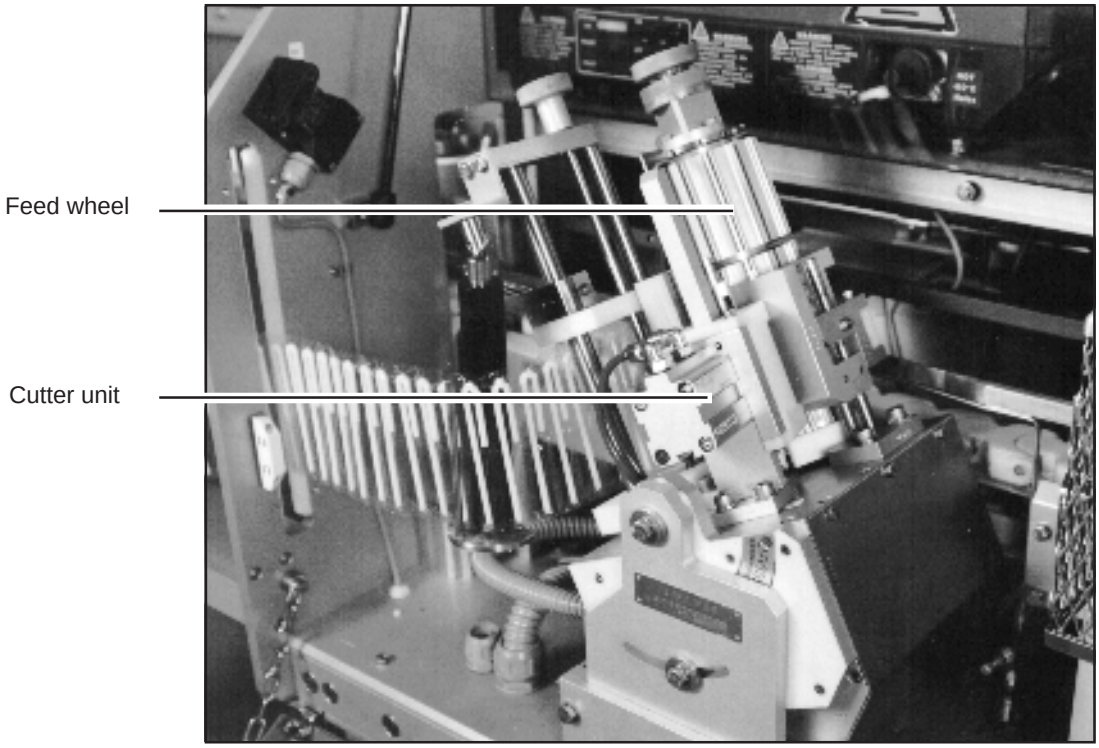
The feed wheel feeds fresh straws keeping pace with those applied. The wheel has cut grooves for the straws, and the pitch of the grooves should match the pitch of the straws in the plasticstraw ladder. Between each straw groove in the wheel, there is a slot, into which the knife enters on cutting the ribbon between the straws.
The wheel is secured on the driveshaft with a key, and it is easy to change; the pitch of U straw ribbons differing from the others, requires a different feed wheel.

Drive

The feed wheel is driven by a stepping motor via a stepping motor circuit board, located in the electrical cabinet of the machine. The stepping motor turns to present a new straw after each application and then locks the wheel in this position. Indexing is started by the control system of the machine, and the length of the indexing movement is determined by a proximity switch, triggered by a toothed wheel on the drive shaft of the feed wheel. This toothed wheel has the same pitch as the feed wheel. As there are two toothed wheels, the correct stop position is automatically selected when a particular straw type is selected by means of the push buttons on the control panel.

Cutter unit

The cutter unit consists of a pneumatic cylinder, knife holder, and knife with guides. The knife is operated by a pneumatic cylinder and cuts the plastic film of the straw ladder between the drinking straws. At both ends of the knife holder, knife guides are fitted for the purpose of ensuring that the knife moves in at the right place in the feed wheel.

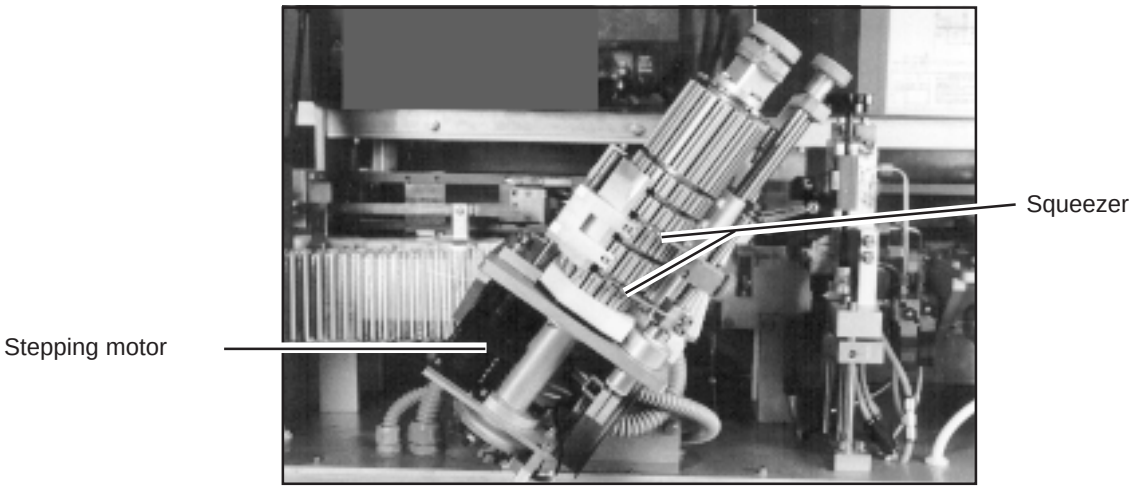


Applicator unit

Squeezers

The squeezers consist of two arms, fitted on a pivot shaft. This shaft is turned by a pneumatic cylinder, acting on a lever. The upper squeezer can be set vertically in one of four fixed positions; which one is selected depends on the length of the drinking straw.

In their rear positions, the squeezers sit in a groove in the feed wheel. When the package has been stopped in front of the applicator unit, the squeezers push the straw out of the feed wheel and press it against the molten hot beads of adhesive. As the adhesive is squeezed and spread over a larger area, it solidifies rapidly and bond the straw to the package.

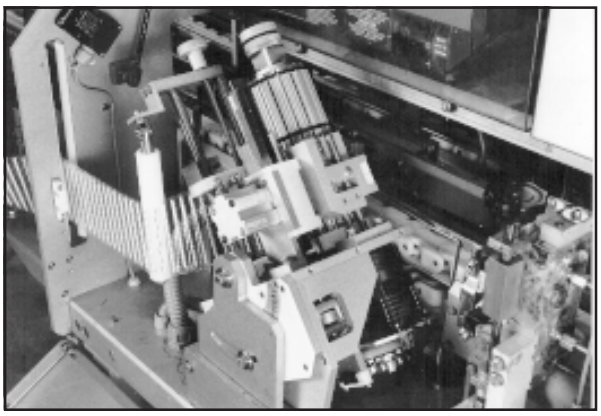


Applicator unit

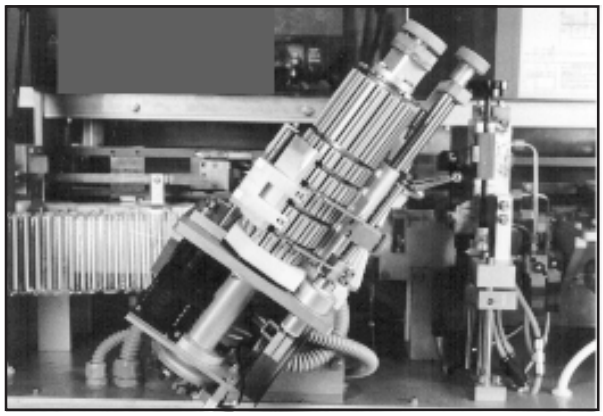
Servicing

The housing of the applicator unit is mounted on a plate, which allows it to be simply detached for servicing. Removed, the unit can be turned through 180° and refitted, which makes it easily accessible for adjustments.

If the angle of the drinking straw has to be altered, for instance on changing volume, the mounting screws of the applicator housing can be loosened and the housing angled in relation to the mounting plate. The vertical position of the straw on the package can be set by means of a screw, raising or lowering a plate under the feed wheel.



Applicator unit in production position



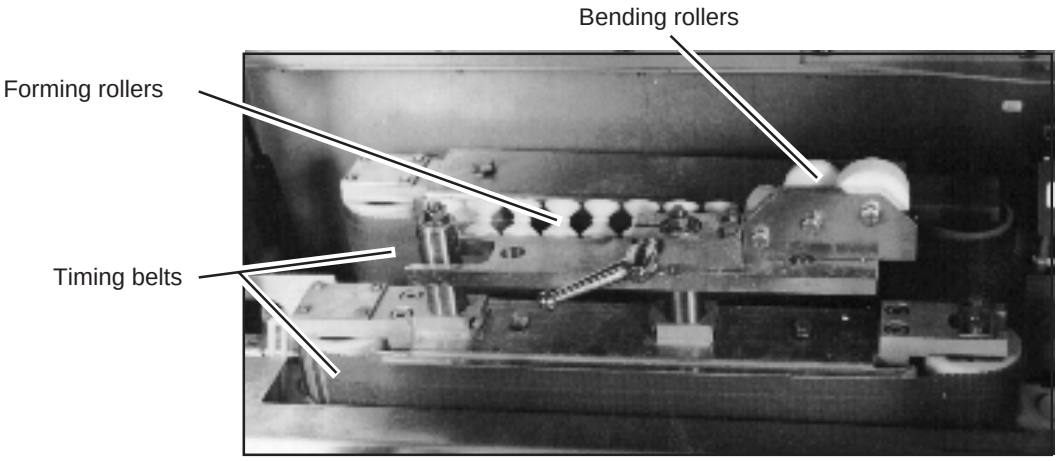
Applicator unit in service position (turned 180°)

Discharge

Flexible straws

If the machine is to be used to apply flexible type straws, it must be equipped with an extra discharge unit. This unit consists of two timing belts, driven by an electric motor. Over the timing belts, bending and forming rollers are fitted.

As the package passes between the timing belts, the bending rollers bend down the straw at the bellows and hold at the same time the straw off the dots of adhesive when the package moves in under the forming rollers. Thereafter, the forming rollers take over and press the upper section of the straw into its final position on the package.



Discharge unit for flexible type drinking straws