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I. Introduction

1. Manual introduces

The technical specifications including machine installation, use and maintenance instructions, the purpose is to help users to more efficient and safe use of the machine, and at the same time to ensure the production quality and efficiency. Suggestions in start machine before work, please read this manual. If the machines have problems and questions, please and contact.

2. Machine description

The linkage filling capping machine set tamponade mechanical, pneumatic, automatic as a whole. It has a high degree of automation, high yield, wide adaptability, good stability, and thus the majority of users of all ages. Now it is getting more sophisticated models mature, with its high technology, adaptability, quality and excellent features for the cosmetic, food manufacturers an ideal special equipment!

The machine has automatic detection of bottles (no bottle no filling, no bottle no plugging, no plug no capping), automatic filling, automatic plug feeding, automatic plugging, automatic cap feeding, automatic capping.

The machine installation environment requirements:

— Machine should be installed in a well ventilated, well lit clean room. Ambient temperature controlled at 5 °C ~ 40 °C. Does not allow dust or toxic fumes.

— Machine four weeks to leave the work space of about 1.5m wide, in order to facilitate operation and maintenance.

— Host Access AC 220V-50Hz single phase AC power, and reliable grounding. Supporting access to AC 380v pump rotor three-phase alternating current, and to link the air pump rotor plug connected, does not allow strong electromagnetic interference.

— Access 0.4-0.6MPa compressed gas source, and check the piping sealed airtight.

— Machine must be installed on relatively flat ground, when the machine is
installed, the machine checks whether the application level instrumentation level, such as uneven, the four legs through the machine to adjust the hoof (Figure 1). When the machine is installed, double-check the machine if all parts is fixed well.

![Adjust nut](image1)

| Figure 1 |

II 、 Machine devices introduced

The filling machine can be divided in to these working stations: Automatic translation bottles , automatic filling, automatic inner plug falling, automatic cap falling and automatic capping (you can see the picture 2.0)

& The machine runs principle:

— — Put bottles one by one on the conveyor

— — Bottles go into filling station .

— — Bottle detection sensor detects bottle filling station if there is bottle or no, if have bottle there, machine start filling. no bottle no filling.

— — After filling, bottle go to next station to be feed with plug

— — Plug detect device sense if bottle is loaded with plug or no, then go to plug press device to be pressed .

— — Then go to cap feeding and pressing device

— — Finally, finished bottle transfer out from conveyor.
The basic technology parameters machine are as follows: (see the nameplate machine)

--- Filling volume: 5~300ml
--- Capacity: 20-35 bottle/min
--- Filling accuracy: ≥99%
--- Plugging accuracy: ≥90%
--- Main motor power: 1.5KW  220V Conversion speed

The user should prepare compressed-air system:
Pressure: $\geq 4\text{Kg/cm}^2$
Flow rate: $0.11\text{m}^3/\text{min}$
Notice: the air must be purified

(Figure 2.1) Filling& Plugging& Capping Machine

1. **Photoelectric detection devices and block bottles**

The photoelectric sensor is used to detect whether there exists the bottle, and feed back signal to PLC to feed bottles into star tray.

2. **Filling device**

Material filling device is to complete the filling operation, including dose adjustment device and filling device, the filling machine for filling operations are divided into three times.

Filling device:
The filling is the key part of filling machine operation, in addition to ensure proper filling action, also need ensure good filling accuracy. Filling body diagram as shown in Figure 2.2:
The filling device structure is simple, the filling works as follows:

This filling device structure is very simple. Its working principle is as below:

—— Rotary valve cylinder closes and make rotary valve connect with material tank.

—— Servo motor runs reversal; drive ball screw to work downside. Drive piston to work downside and make material tank suck liquid medicine. The sucking volume can be adjusted by "FILLING VOLUME ADJUSTMENT" on screen.

—— Rotary valve cylinder opens and make rotary valve connect with material tank and filling nozzle.

—— Servo motor runs in positive rotation; drive ball screw to work upside. Drive piston and make liquid medicine in material tank flow into the bottles through rotary valve and filling nozzle.

—— If material tank has leakage, changing gasket ring on piston can slove the problem.

—— To prevent over-adjusting the volume, there is a position-limited switch on volume adjusting device. Over adjusting the volume is easy to break connecting rod structure. When the volume reach the Maximum position, the machine will stop automatically.
Users should reduce the volume properly.

(Figure 2.3) Filling valve
If not in the state of filling, rotary valve cylinder and filling valve do not open and make measurement cylinder and material tank keep in connection. Now, if there is a signal that it needs to fill, rotary valve cylinder opens. At this time, measurement cylinder and filling nozzle are in the state of "start", then liquid will be filled into the bottles from filling head.

3. **Automatic Plug Feeding**

--The inner plug will be transferred from the vibrator and go along the chute to the plug loading station.

--Adjust the plug in the loading station to aim at the bottle mouth which under the plug loading station

--Then the loading cylinder move down, fall the inner plug to bottle mouth.
Horizontal limit air cylinder and clamp bottle neck air cylinder is for bottle E only for plug loading. For other bottles, can close these two air cylinders to make it not work.

Here, after plug loading station, there is a approach sensor which is used to sense if there is plug loading on bottle or no. Only when it sense plug on bottle mouth , PLC will control the cap loading station start working. If there is no plug sensed, the cap loading station don’t work. Also, if the plug not be loaded on bottle mouth properly, can not load cap properly too, so need to adjust the plug pressing device to press plug close into bottle mouth.
4. Automatic Plug pressing device

After load plug on bottle mouth, the next step is to press the plug into bottle tightly. Plug pressing device is as shown Figure 2.6:

(Figure 2.6) Plug pressing device

5. Cap feeding device

After plug pressing, the bottle now comes to the cap loading station. It is to load cap on bottle mouth. Its shape is as Figure 2.7:

(Figure 2.7) Cap feeding device
Cap come from vibrator and go along the cap feeding chute to cap loading station. Cap loading air cylinder go down, to push cap onto bottle mouth, then go to next station.

(Figure 2.8) Cap loading station

6. Capping device

After cap loading, bottles go to cap pressing station. The steps is as following:
Capping device

Bottles loaded with caps go under cap pressing station.

Lifting pole go down by working of lifting cam, and drive the capping device go down, capping device rotation driven by capping motor.

When the capping device down to cap, the cover drive to complete the capping operation with the rotation. Capping device when under pressure due to the internal action of the spring, can play a cushioning effect to prevent the outer cover, bottle crushed; another rotation in the drive cover, due to the security role of the torque regulator, (when torque is too much, the balls inside regulator will be misplacement, so that capping device running idle) to prevent rotation too much to demage bottle and cap.

After the completion of capping operations (Capping time is controlled by cam), bottle clamp air cylinder return back, and lift pole raise up by working of the cam, until the bottom of the capping device also left the cap, star wheel begins to rotate to move out bottles.
7. Control panel

I. Open load switch, display "Main" screen:

Click anywhere to enter the main operation page.

II. "Main operation "page

This page is for manual debugging, press \textcolor{blue}{\textbf{Operate}} button of each function, go to its debugging page for it.
Click button go to "automatic operation page", picture as follows:

1. Displays the current accumulated production amount, press "clear" button to remove the production amount to zero.

2. Show current conveyor running frequency. Can change the frequency by changing the data on the message box.

3. Shows current running frequency of the star wheel, can change the frequency by changing the data on the message box.
4. In automatic operation page, click button it turns to red, means can feed bottles into star wheel.

5. Click , when it turns to red , means filling function is turn on. The 3 nozzles can work at the same time, and also can work separately. The displaying filling volume is a single nozzle’s filling volume.

6. When need feed plug, click this button to feed plugs, when this button turns to read, means the plug feed function is turned on. For bottles which do the filling only, turn off this button.

7. When need feed cap, click this button to feed caps, when this button turns to read, means cap feed function is turned on. For bottles which do the filling only, turn off this button.

8. Press button, capping motor start working.

Press it, the plug vibrator and cap vibrator start working to feed plugs or caps.
9. When in manual debugging status, press this button to turn on transfer pump and product feed butterfly valve; when in automatic operation status, click it to pump liquid into hopper by transfer pump automatically.

10. Click this button, enter parameter setting page as follow:

![Parameter Setting Page]

11. Click this button, recover the parameter to factory defaults.
12. It is door protect switch. When it is in the OFF status, open the door or door not close well, machine will stop automatically and go to alarm page. When it in ON status, door protection function invalid, open the door, machine keep on working.

13. Press key, pre-set production amount (task) invalid, machine keep on working even finish the setted production quantity.

14. Press key go back to former page.

III. "Filling servo parameters and jog Settings" page:
Press “Operate” button beside nozzle1, Nozzle 2, Nozzle 3, go to jog debugging page, it is to set parameter of the filling motor for automatic operation.

1. **Valve Time**
   - 0.0 S
   - It is to set and adjust the filling air cylinder time to change from liquid suck to liquid filling status.

2. **Filling Volume**
   - 0.00 ml
   - Used to set and adjust the filling amount (Adjust the move trip to drive the ball pole by servo motor.).

3. **Filling Speed**
   - 0 r/min
   - It is to set and adjust filling speed, i.e. the turning speed of the filling servo motor. Can be adjust by the filling volume of bottles.
4. **Zero Filling Vol. Speed**: It is used to set and adjust the speed to suck liquid and back to original position of filling servo motor, i.e. the speed of return to original position per minute of the servo motor.

5. Click **CIP Nozzle** go to automatic cleaning program, the 3 nozzles can be washed separately. Before cleaning, should change by cleaning nozzle and cleaning hose.

IV. "Manual" operation page:

On manual debugging page, click **Operate** button beside each function, go to jog page for this function.

1. Click the "Operate" button go to bottle gate manual operation page.

This page can set bottle gate delay time.

2. Press **Plug Feed** click "Operate” button go to manual plug feeding debugging page.
This page is to debug pug feeding page, can set plug operation time, plug engage time, plug pressing time, plug vibrator strength and plug vibrator time. Can refer to the default parameter set before machine leave manufacturer.

for bottle E only.

3. Press , click "Operate" to go manual cap feeding debugging page.

It is to debug cap loading, can set cap operation time, cap engage delay time, cap vibrator strength and cap vibrator time. Can refer to default parameter set before machine leave manufacturer.
4. Press cap support button and click "Operate" button to go to cap support debug page.

This page is to debug cap support air cylinder, can set bottle gate delay time. Cap support device is for square caps to help capping in right position. By changing cap support plate and adjust its position to correct cap to make it capping well.

5. Change to other page.

"Alarm window"
Filling overtime message means bottle turns to next station for feeding plug but not finish the liquid filling yet.

Need press button return to original operation page.

This message means star wheel over loaded, need press button back to original operation page.

This message means filling beyond upper limit, need press to reset, then press button return to original operation page.
System emergency stop!

Door switch Protect!

This message means the door is opened when machine is running. Need press the key to reset then return to the original operation page.

This batch finish!

This message means the pre-set production amount is finished. Need press the key to reset and return to the original operation page.
This message shows servo motor alarm, need press the key to reset, and return to the original operation page.

8. Circuit diagram and pneumatic diagram machine

Circuit diagram
Pneumatic principle diagram
Pneumatic solenoid valves physical map and the corresponding function
The machine operation and use

1. Operation notice

Any wrong/incorrect operation will cause hazards, in order to avoid dangers, please read this Instruction in details and operate according to these instructions & suggestions shown in each chapter/section. This machine must be operated by special technicians and by professions refer to the electricity & pneumatic. The technicians in charge of installation/ trial run /maintenance/repair have to read/grasp all the Safety Instructions in this manual.

Some dangerous parts of this machine all equipped protecting devices that must be paid more attentions to be activity /validity before any operation. When operating as soon as find any exception, must immediately report. The machine can operate until remove the safety problems otherwise the machine must be stop.

The operating process to the operators must be abided.

— All the safeties/operations/maintenances/relevant technical data in this Manual.
— All these standards/other relevant measures must be achieved to avoid dangers.
— Must be operated by the skill technicians who are familiar with removing malfunctions & maintenances.

2. Machine start-up

Before the first start while finished installation, must do that corresponding electric/pneumatic connecting & dosage adjusting.

3. Electric Connecting

Put the Power Plug into the socket and check if the voltage is same as the requirement of machine i.e. single-phase 220V 50Hz & power range more than 1.1 KW. Don’t use the temporary or improper wire/cable for this connecting to keep damages away the machine.

Pneumatic Connecting

Connect the pipe of Air Compressed and the Pneumatic Tube on the machine. Don’t use the temporary or improper pipes for this connecting to keep damages away the machine because of the easy cauterization. Pay more attention to avoid connecting in reverse and keep the air pressure at more than 4Kg/cm²

Dosage Adjusting

In spite of the dosage already set up accurately before the machine out the factory, for first start while trial run, must adjust the dosage to make sure the dosage is complete accurate.
Adjusting Devices of Each Station

It is necessary to operate this machine correctly that Devices of Each Station must be harmoniously running without any problem, otherwise there will be caused troubles anyplace on these stations. Before production especial the first start, it must be sure that these stations are in the right installation & assembly.

— The Converyer inlet/outlet must aim to the graduated gap on the turn table;
— Check the filling pistol to aim the mouse of bottle
— Check the Caps Falling/Screw Capping devices to aim the bottle mouth.

Inspections before start up

Must check all the necessary devices before start the machine to make sure that
— circuit/pneumatic piping is in right connecting,
— all components are in right assembly, the bottle is straightway in feeding,
— the alcohol tank is fully loaded

Machine start

Make sure the compressed air has already start supplied before you start the machine and the sequence is:
-- pour the alcohol in to the alcohol tank
-- insert the key, turn on the power supply
-- review the chapter of control panel

Machine stop

Review the chapter of control panel

Trouble shooting and Maintenance:

The machine troubles will be caused due to some improper operations/data set up etc. during the machine being run. Hereunder are some normal troubles and its potential reasons & settle measures.

<table>
<thead>
<tr>
<th>Fault phenomenon</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filling device exclusion:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. Filling dose not accurate | Piston O-ring wear out | — — Change new O-ring seal
| | Particles go into valve | — — Open the valve to clean it.
| | | Note: The valve should be fix with seal, and the material must be filtered
| 2. Star wheel stop frequently | Bottle get blocked on Conveyor | — — Adjust the bottles on conveyor.
| | Overload protector is too loose | — — Adjust the spring of overload protection to make it tight
| | Photoelectric sensor failure | — — Check the sensor, clean the optical head, as has been damaged is replaced.

**Plug loading failure**

| 1. Feeding plug is not accurate | Star tray and plug loading position is not adjusted well | — — adjust the plug loading station and star tray to make them as homocentric
| | Plug in the feeding chute doesn’t go smoothly. | — — Adjust the joins of plug chute and vibrator to let plug go smoothly.
| 2. Plug feeding not timely | Magnet gap is too large. | — — Adjustment
| | Spring pole or fixed oblique block fracture. | — — Change
| | Cap in the feeding chute doesn’t go smoothly | — — Adjustment
| | Cap vibrating frequency is not strong enough |  

**Cap loading failure**

Daily Maintenance

It will reduce the machine troubles to abide following maintenance operation instructions.

— Keep the machine being clean & tidy

— Avoid any possible damage
—Avoid the non-systematic temporary/emergent repair

Safety Guidance In Maintenance Operating

Abide SAFETY GUIDANCE in any machine operation. Must cut all the Suppliers to make sure the operations regarding Electricity/Gas/Compressed Air is absolute safe while operating inside the machine.

Maintenance Periods

Daily
—Check all the Electric/Pneumatic connections in each unit;
—Clean the Sensors carefully removing all the dust/particle that will influence the right operation of the machine;
—Rub-up the machine completely, without use water to scour, after work;
—Drain the water in the Vacuum Holder & the Oil/Water Separator every shift.

Weekly
—Check all the Sensors to make sure the fixation is firm;
—Check all the Buttons & Control System is in the normal situation;
—Check the electric wiring connector;
—Lubricate all the moving parts in stations, to use the medicinal silicon oil as lubricant to the machine surface.

Monthly
—Tighten all the fixation Bolts in all units;
—Remove all the leakages in all Pneumatic Units.

To Pneumatic Units, check/clean all Pneumatic Solenoids; To electric equipments, check safety protect devices and Buttons/Switches/indicator Lights. To operation test, under different condition check machine running states.

Replacement of the mold machine

For different bottles and plugs, caps, need change corresponding parts.
Below the change parts for bottle A.

Change parts for bottle B

Change parts for bottle C
Change parts for bottle D

Change parts for bottle F
Change parts for CIP nozzle, air nozzle etc.

First is to replace the star tray and the guide rail. When replace the stray tray, need to loosen the fasten screw in the middle of the star tray, please see below
When change the star tray, need stop the machine when the star tray is in stop station, i.e. the star tray station is right aim to the bottle entrance, now can replace the star tray. Otherwise can not assure the star tray can aim to each related station. When put new star tray on the machine, adjust the bottle entrance aim to one station of the star tray, then can lock the fix nut.

After replace star tray, also need to adjust clamp bottle device of plug loading station and cap loading station aim to the star tray station center. During the adjustment, can take out the cap vibrator and plug vibrator to reduce the machine weight, which can make easier adjustment and assure the accuracy to aim at center of each station. What’s more, need adjust the height between bottle clamp device and bottle mouth, see below photo:

1mm-2mm distance between bottle mouth and loading station
Adjust steps is as following:

Loose adjust screw, then turn the adjust pole to adjust the height.

When adjust the height between plug loading device /cap loading device, need adjust the bottle clamp device and bottle mouth distance in 1-2mm, can not more than 3mm. As above photo, especially the plug loading device, if the distance is more than 3mm, it will make plug loading accuracy not good.