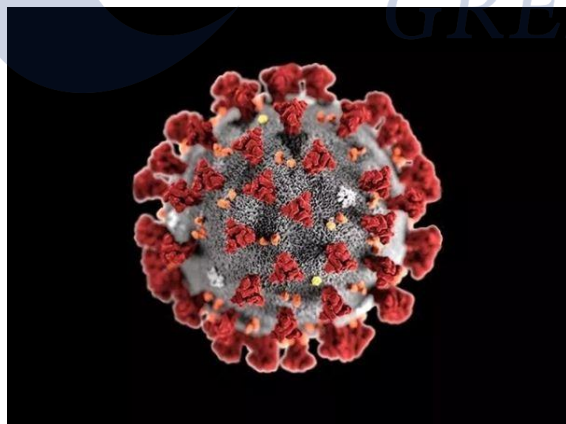第一部分

智能自识别口罩全自动化生产线

Part1： Intelligent Self-identify and Automatic Mask Production Line

一、项目背景：Project Background

2020年初，冠状病毒感染肺炎疫情突然爆发，1月23日，广东省正式启动了重大突发公共卫生事件一级响应，随着疫情发生持续发展，防护服、口罩需求剧增，由于处于春节假期，各类防护用品及专用生产设备紧缺，春节期间公司就组织工程技术团队开展口罩自动化生产线专项研究设计。

In the beginning of 2020, COVID-19 suddenly exposed in China. On January 23, Guangdong Province officially defined it as a Magnitude Outburst Public Health Incident. With the continuous spread of the epidemic, the demand of protective clothing and masks has increased rapidly. Due to the shortage of all kinds of protective equipment and special production machine during the Spring Festival, our company organized technical teams to carry out special research and design on mask automatic production line.

2月中旬，各地企业快速响应，积极转产、投产口罩生产，因市面生产口罩的机器一机难求。针对口罩生产线的需求量加大，巨轮智能装备股份有限公司发挥自身在自动化设备方面的优势，瞄准应用领域要求，加大研制力度，利用原有领先的减速器、控制器、视觉、快速分拣技术，开展"智能自识别口罩全自动化线（JLKZX-001型）"的研制工作。目前无论从工艺路线、机件结构、造型设计、关键零部件以及性能参数，都处于业界领先水平。JLKZX-001型"智能自识别口罩全自动化生产线"正以压倒性的产品优势批量投入市场，巨轮智能将为战胜冠状病毒感染肺炎疫情作出新贡献。

By the mid Feb, enterprises from all over the country activaly turned into the masks production to meet the increasing demand of mask production line. To solve the shortage problem of mask making machines, with its leading technology in reducer, controller, vision, rapid sorting application, Greatoo made full use of its advantages in automation equipment and conducted R&D on the development of JLKZX-001, an Intelligent Self-identify and Automatic Facial Masks Production Line. Presently, JLKZX-001 stands at top aspect whatever process route, machine structure, modeling design, key parts or performance parameters. It is penetrating the market with overwhelming product advantages. Greatoo Intelligent will make new contribution to the overcome coronavirus.

二、智能自识别口罩全自动化生产线
Intelligent Self-identify and Automatic Facial Masks Production Line

智能自识别口罩全自动化生产线（JLKZX-001型）由一台本体加2台耳带点焊机组成。从口罩本体生产到耳带熔接，鼻线熔接直至出成品，完全自动化，不需任何人工操作。

智能自识别口罩全自动化生产线（JLKZX-001型）是将一台口罩本体制作机与二台口罩耳带熔接机相连接当口罩本体做成后由传输带送至口耳带熔接机进行耳带部分的溶接。可以完成一个完整的耳朵口罩,仅需一名操作员即可操作整条生产，该产线实现平面口罩的全自动化生产，主要包含卷材上料、折叠压合、鼻梁筋上料、口罩成型、口罩切断、耳带上料及焊接、视觉分拣检测（选装）、成品下料等工艺，完成从原材料到口罩成品的整个生产过程。

JLKZX-001 consists of a main body and 2 sets of strap spot-welding machines. It is fully automatic from mask body to strap and nose clip welding and finished product. Manual work is not required.

JLKZX-001 connects a mask body machine and two ribbon welding machines. The mask body will be sent to the ribbon welding machine through conveyor. It only requires one operator to operate the whole production line to manufacture one mask. It is a fully automatic production line, containing material feeding, folding, pressing, nose materials feeding, forming, cutting, ear strap assembly, visual inspection, product finish etc. It involves the complete process from raw materials to finished products.
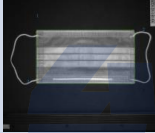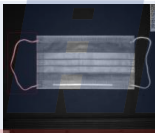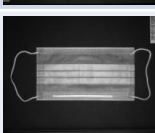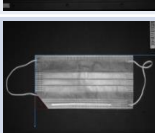
二、智能自识别口罩全自动化生产线
Intelligent Self-identify and Automatic Facial Masks Production Line

　　智能自识别口罩全自动化生产线（JLKZX-001型）是有一条自动分疏系统连接一台口罩本体机和两台外耳带机组成。口罩机生产的口罩本体，可由plc平均分配到两套外耳带机上以每分钟80-100片的速度生产。全过程都可以通过人机介面触摸屏操作控制，全自动化口罩机投产后日产口罩10万只以上（24h生产）。

JLKZX-001 consists of a main body and 2 sets of strap spot-welding machines. It is fully automatic from mask body to strap and nose clip welding and finished product. Themask body produced by the mask machine can be evenly distributed to the two external strap machines through PLC with the production of 80-100 pieces per minute.The whole process can be operated and controlled through the touch screen .Ater the full automatic mask machine is put into production .It can produce more than 100000masks per day(24hours)

三、口罩生产过程中易产生的问题 Common Problems in Mask Production

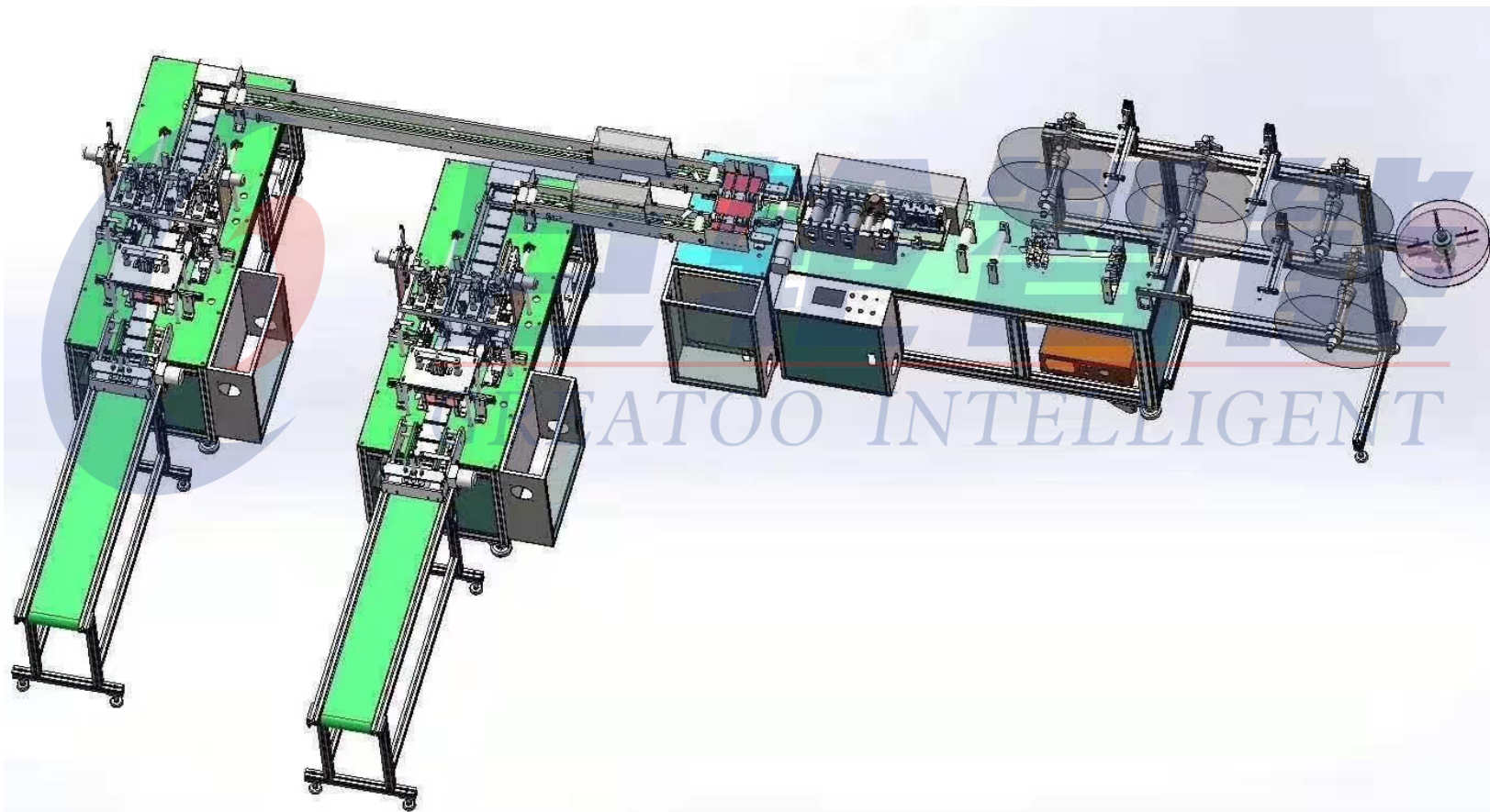| 序号	质量缺陷	影响	
1	口罩主体长短偏差 Body length variation	主体不良 Body NG	
2	耳线点焊偏差、长短偏差 Ear strap length variation	耳线断裂 Strap breaking	
3	鼻梁线长短偏差、缺失 Nose part length variation	残次品 Imperfection	
4	正反面异物 Inside/Outside dirts	脏污 Dirts problem	
5	封边不良 Improper sealing	残次品 imperfection	

由于口罩全自动化线生产节拍快，对产品标定定位要求高，需要实现快速识别、定位、分拣、图形检测，智能自识别口罩全自动化线运用了3D及2D视觉技术（选装功能），实现了高速运动下的产品识别及位置辨别，并实现快速检测，保证了产品产出的高一致性，高稳定性，高均匀性，在确保效率的情况下大幅提升产品品质。

To meet the requirement fast production rhythm and high requirements for product calibration and positioning, the production line requires rapid identification, positioning, sorting and graphic detection. JLKZX-001 uses 3D and 2D vision technology (optional function), which realizes product identification and position recognition under high-speed movement, and realizes rapid detection to ensure high consistency and high stability of product output Qualitative, high uniformity, greatly improve product quality while ensuring efficiency.

四、整机设计图 Complete Structure

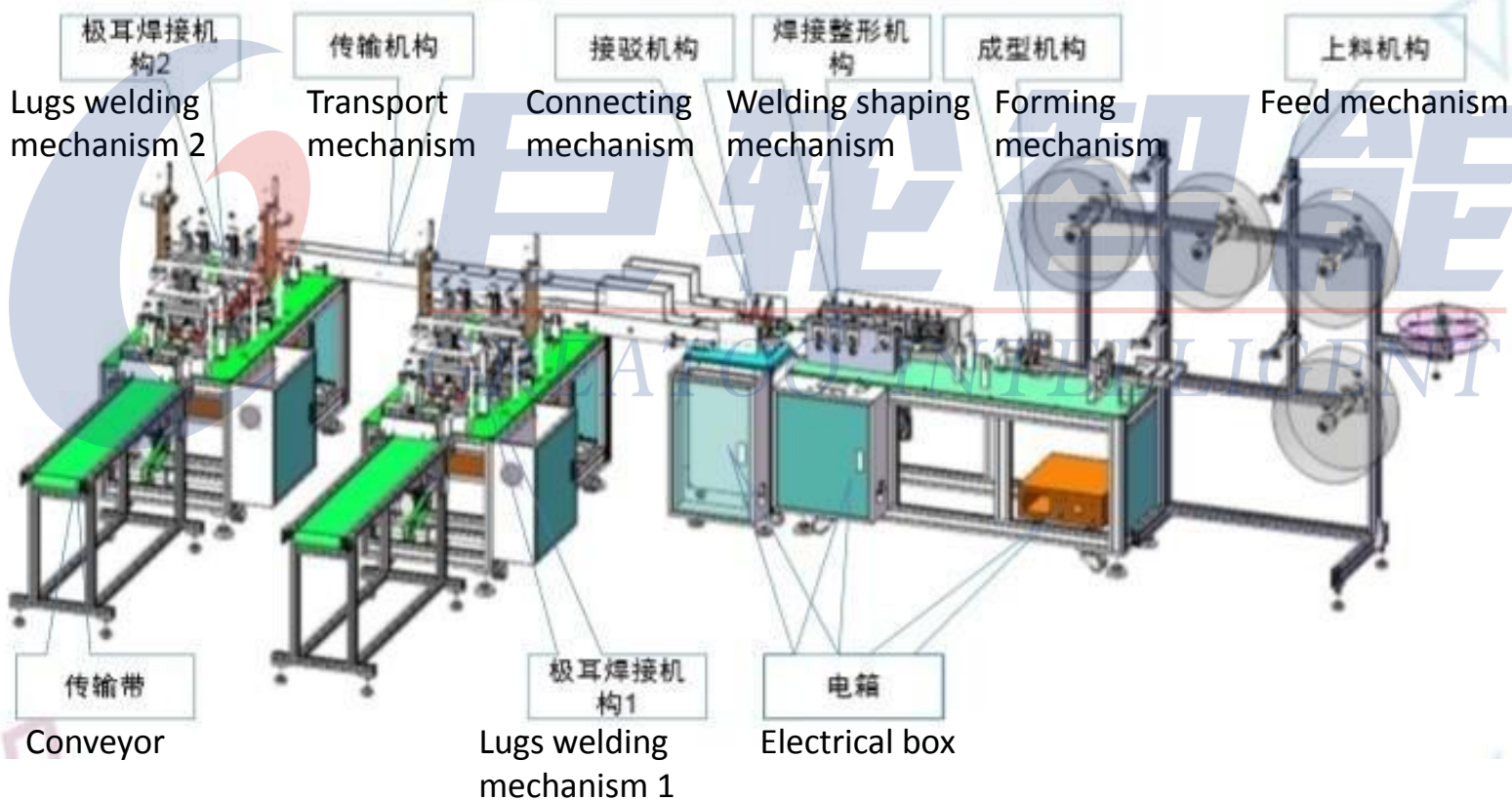五、工序分布图 Process distribution

Conveyor belt
输送带

Sheet forming
片体成型机用

Mask raw materials
口罩原材料

Ear belt station 1
1工位上耳带

Visual detection station
视觉检测工位

Discharge conveyor belt
出料线体

2工位上耳带
Ear belt station 2

鼻线
Nose wire

出料线体
Discharge conveyor belt
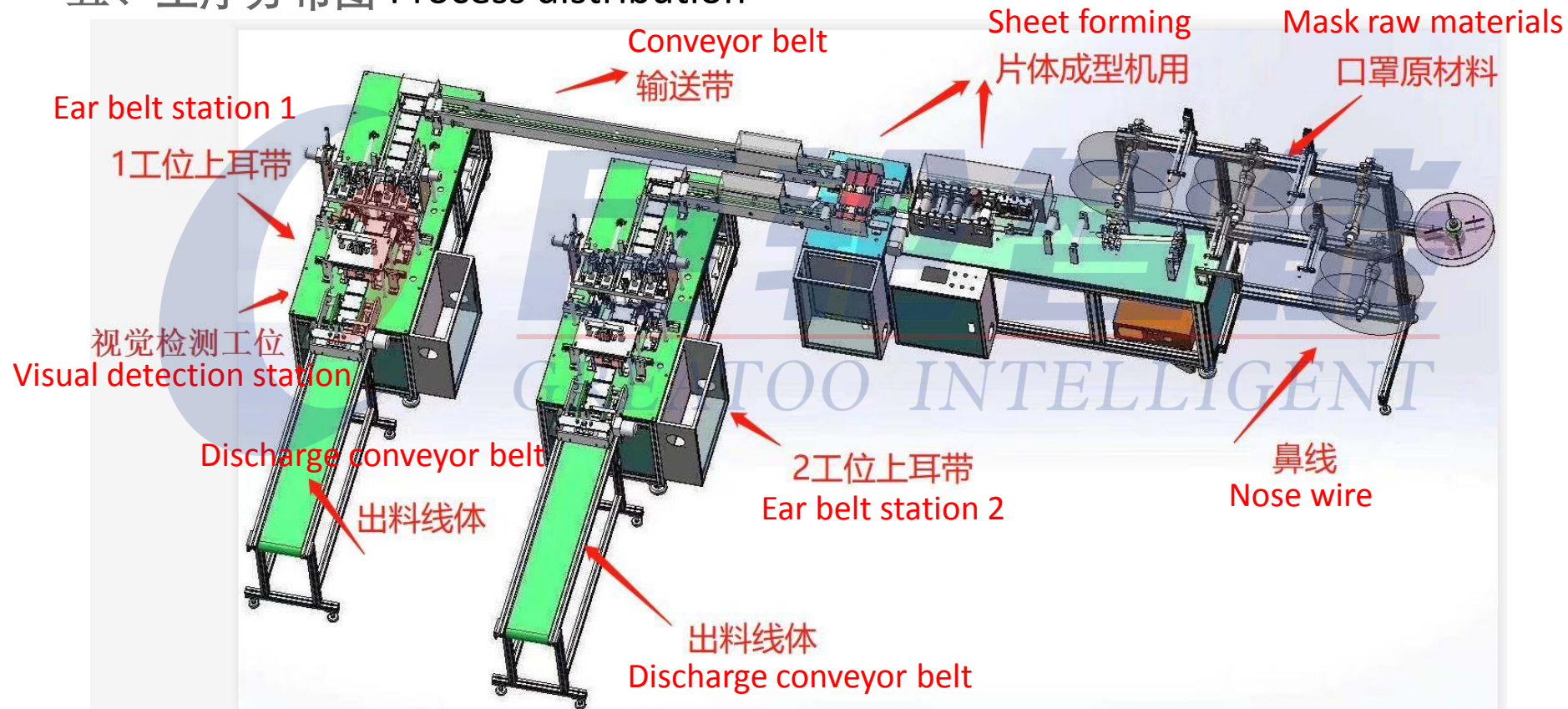
Intelligent Self-identify Automatic Mask Production Line

智能自识别口罩全自动化生产线

极耳焊接机构2
Lugs welding mechanism 2

传输机构
Transport mechanism

接驳机构
Connecting mechanism

焊接整形机构
Welding shaping mechanism

成型机构
Forming mechanism

上料机构
Feed mechanism

传输带
Conveyor

极耳焊接机构1
Lugs welding mechanism 1

电箱
Electrical box

让自动化变得更简单

尺 寸 图
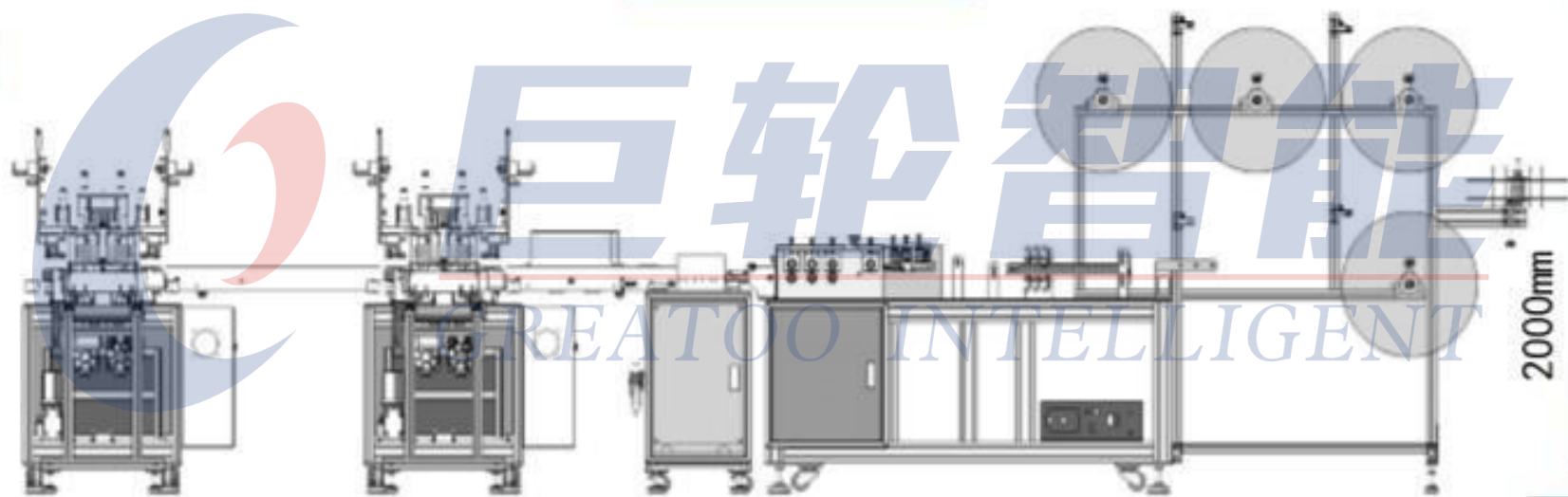
2000mm

6800mm

长度6800毫米 X 宽度3800毫米 X 高度2000毫米

H*W*H
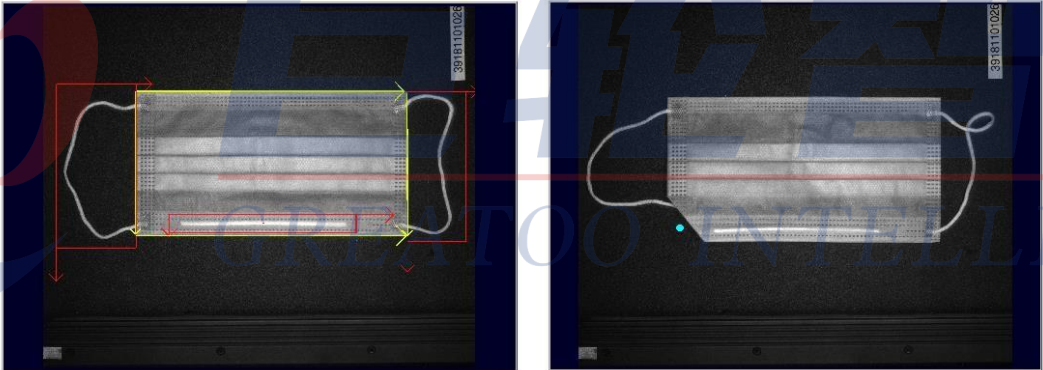
六、智能视觉质检效果 Intelligent Visual Inspection

口罩机缺陷检测系统 Defects Inspection System

Length	口罩长度	17.510342	耳线状态 Ear rope	OK	封边状态	NG	Sealing
Width	口罩宽度	9.293916	鼻梁线状态 Nose part	OK	是否有异物	OK	Foreign matter

让自动化变得更简单

类别 Category	检测项目 Testing Items	检测精度 Testing Accuracy	误检率 Error Testing Rate
检测指标 Indicators	耳线长度测量 Eer strap length	±1mm	
	口罩主体长短测量 Main body length	±1mm	
	鼻梁线长度测量 Nose bridge length	±1mm	
	鼻梁线偏位测量 Nose bridge asymmetrical measure	±1mm	
	耳线偏位测量 Ear strap asymmetrical measure	±1mm	≤2%
	排齿数量检测 Teeth number measure	用户自定义 Customized	
	封边不良检测 Improper sealing detection	±1mm	
	口罩折角检测 Folded corners detection	±5mm²	
	口罩异物检测 Foreign matter	肉眼可见 Eye visable	
检测能效 Testing Efficiency	150pcs/min		

七、技术参数 Technical Parameters

1.功能：

a)自动口罩原材料送料：人工放料到料架，带缺料报警功能；

b)穿鼻线、封边；

c)超声波焊接：20KHZ，配专用超声波焊接模具；

d)片体成型裁剪：纵向方向裁剪，切口平整；

e)耳带进料、熔接：耳带长度可调；

f)成品堆叠、出料：堆叠数量可调（1-50）；

g)皮带线输出：保证有序出料。

1. Function：

a) Mask material automatic feeding device: the worker only need to put the material to the rack and the device is with Alarm function when starved feeding;

b) install the nose wire and edge sealing ;

c) ultrasonic soldering:20KHZ, with specialized ultrasonic soldering mold ;

d) Strip shape technology: longitudinal cutting and neat slice ;

e) Ear bands material feeding and welding: The length of ear band is adjustable;

f) finished-product pile up, discharge device: the pile-up amount is adjustable(1-50);

g) Belt line output, ensure orderly discharge.

七、技术参数 Technical Parameters

2. 产能：一拖二，80-100PCS/min。

3. 工作模式：单循环与循环（循环节拍时间可调）两种工作模式

4. 选配智能视觉系统，自动识别、检测、筛选口罩，通过视觉进行产品分拣、质量检测。

2. Capacity: 2 pieces one time, 80-100PCS/min.

3. Working mode: single cycle and cycle(frequency is adjustable).

4. Equipped with intelligent vision system which can automatically identify, inspect and filtrate masks,to complete product sorting and quality detection.

5.安全、设置、显示、记录：设备具有漏电、过载，防撞、急停等保护功能。显示屏上可对工作 模式、上下料工作方式进行选择，显示屏可实时显示合格品与不合格品数量及合格率

5.Safety, setting, display, record: the equipment has leakage, overload, anti-collision, emergency stop and other protection functions. The display screen can choose the working mode and loading and unloading working mode, and the display screen can display the quantity and rate of qualified and unqualified products in real time.

八、关键零部件

1. 气缸、电磁阀、三联体：亚德客；

2. PLC：汇川；

3. 伺服电机、触摸屏：汇川；

4. 视觉系统：汇川；

5. 电源/传感器：日本欧姆龙；

6. 超声波：台湾德诺。

九、质保期

非人为损坏情况下保修一年。

Key Components

1. Air cylinder, radiotube, triplet: Airtac；

2. PLC:inovance；

3. actuating motor, touch screen: Inovance；

4. visual system: Inovance；

5. power supply/sensor: Japan Omron；

6. Generator:TAIWAN DELOK

Warranty
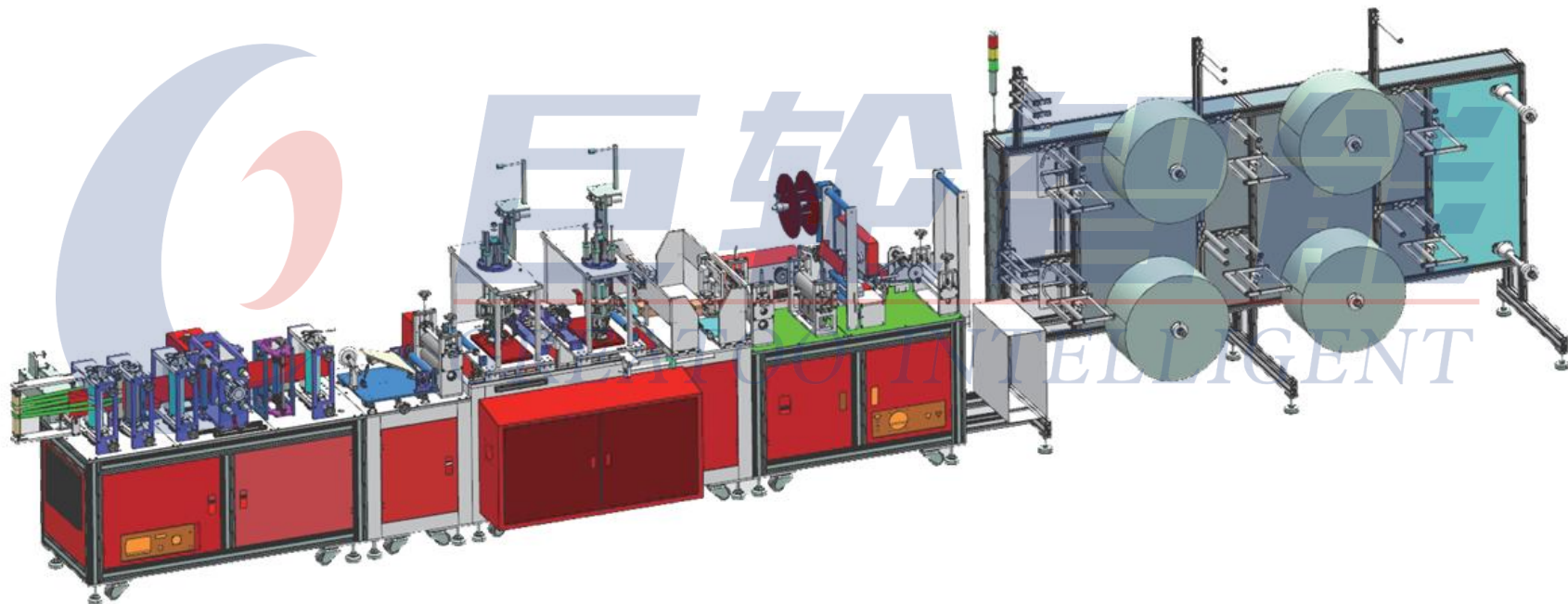
Non-human warranty for daage for one year.

巨轮智能装备股份有限公司
GREATOO INTELLIGENT EQUIPMENT INC.

第二部分
智能KN95口罩全自动化生产线

Part2： Kn95 Intelligent and Automatic Mask Production Line

一、整机设计图 Complete Structure

二、产品介绍 Product Introduction

　　智能KN95口罩全自动化生产线采用铝合金结构；主传动采用减速电机驱动，通过更换模具生产不同形状规格产品。KN95蝶形口罩折叠机通过一次成型，完成蝶形口罩的杯体成型。蝶形口罩折叠机主要包含卷材上料、鼻梁筋上料、焊接 花纹、折叠、熔接、口罩成 型以及切断等工艺，完成从卷料原材料到口罩杯体成型的整个生产过程。

　　生产的口罩具有佩戴舒适，无压迫感，口罩过滤效果好，契合人的脸型， 可适用于医疗、电子、矿业、建筑等行业。

Kn95 Intelligent and Automatic Mask Production Line adopts aluminum alloy structure; the main drive is geared motor, different shapes and sizes masks are produced by changing different modules. The N95 butterfly mask machine completes the cup formation in one pass, there are some processes to complete the entire production, such as coiled fabric feeding, nose bridge feeding, welding pattern, folding, welding, mask forming and cutting etc. Produced masks are comfortable to wear, no tight pressure and with a good filtering effect.

They fit the human face and can be used in medical, electronics, mining, and construction industries.

三、产品特点 Product features

● 采用自动化，减少人工需求。

● 生产高效，单位时间产出量，生产节拍范围30件/min。

● 结构紧凑，占地面积小。

● 高品质，故障率低。

● Automation production reducing labor.

● Efficient productivity: 30pcs/min

● Compacted with small volume

● High quality, low failure rat.
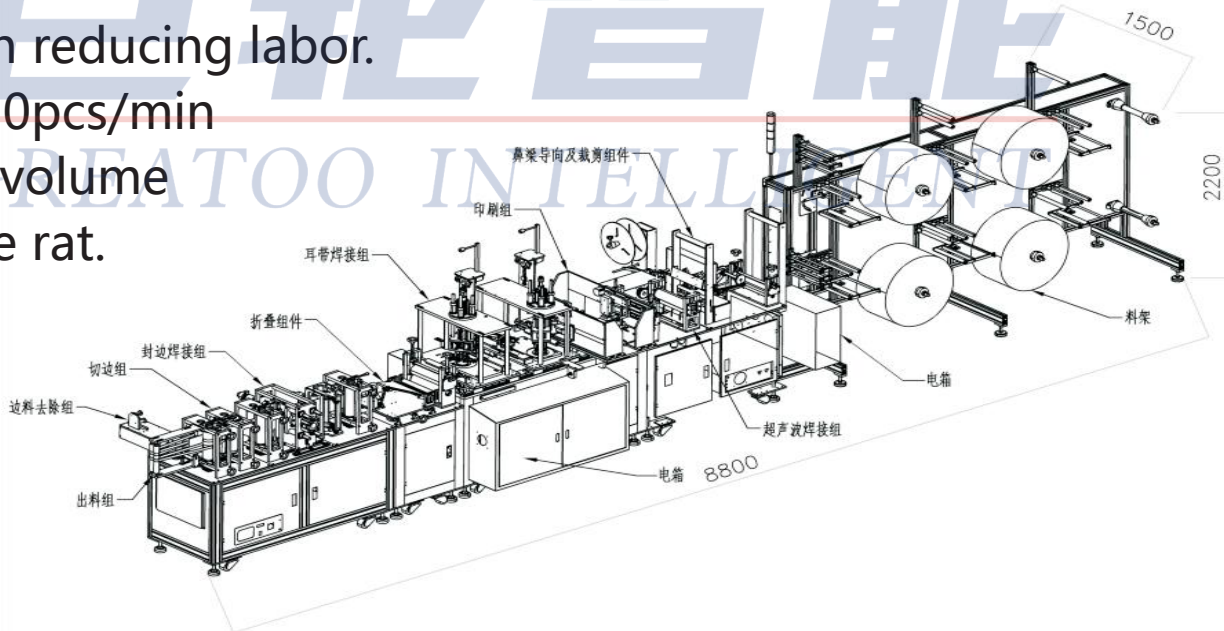
四、设备参数参数 Technical Parameters

序号	项目	技术规范参数	备注
1	供电电源	～220V±10%　50Hz±2%	
2	控制电源	～220V、24V	
3	设备总容量	10KV	
4	总熔断电流	40A	
5	电器安装方式	独立电柜	
6	生产节拍	30件/min	
7	外观尺寸	～8800x1500x2200mm(长X宽X高)	
8	设备总重量	～1400Kg	以实物为准
9	工作环境	无可燃性气体，腐蚀性气体，无尘	

Item	Description	Specifications	Note
1	Power supply	～220V±10% 50Hz±2%	
2	Control power	～220V、24V	
3	Total capacity (Nominal Voltage)	10KV	
4	Fuse current (Nominal current)	40A	
5	Electrical devices installation	independent electric cabinet	
6	Productivity	30件/min	
7	Dimension	～8800x1500x2200mm (LengthXWidthXHight)	
8	weight	～1400Kg	(for reference only）
9	Working environment	No flammable gas, no corrosive gas, no dust	

五、设备组成 The main structure of the equipment

1. 设备配置布料放卷Max6套，卷径Max600mm；
2. 布料放卷采用主动放卷方式，根据张力辊位置自动放卷；
3. 鼻条焊接模块：包含鼻条放卷、鼻条整平、定长输送、裁切、焊接功能；
4. 布料复合滚焊单元：采用超声波焊头与钢模焊接方式，焊接时辊平行度、位置精密可调，焊接系统有冷却系统功能；
5. 耳带焊接单元：本设备耳带焊接采用耳带式（非头戴式），整卷上料，经过驱 动与张力控制后，定长裁切，耳带长度可 调节，采用超声波焊接，焊接牢固；
6. 设备具备印刷功能，印染Logo位置可调节，内容需甲方提前提供；
7. 拉料驱动单元：采用伺服电机控制主驱辊，驱动布料，运行平稳，压力精密 可调；
8. 对折成型单元：采用可调节三角板，高度、角度可调，保证口罩对折居中性
9. 成型焊接单元：采用超声波焊接，焊接牢固，花纹清晰， 焊接系统压力可调， 焊接系统有冷却装置，超声波焊接系统技术参数可调；
10. 成型切割单元：滚切刀轮，刀垫轮，压力可调，切割面料：高速钢；
11. 废料分离单元,废料自动落框；
12. 控制系统：设备包含PLC控制系统，触摸屏操作系统。

1.Max 6 rolls of non woven fabric, Max roll diameter: 600mm

2.Fabric rolls actively unwinding according the tension roller's position.

3.Nose bridge bar welding unit: nose bridge coil unwinding, nose bar flatting, fixed length conveying, cutting, welding.

4.Fabric roll welding unit: using ultrasonic welding head and steel mould to weld fabric, the roller's parallelism and position are accurately adjustable during welding, and the welding unit has cooling function.

5.Ear cord welding unit: adopting the ear cord type (not head cord), the whole cord coil is loaded, through driving and tension control, the fixed length cord is cut, the length of the ear cord is adjustable, the ultrasonic welding is firm.

6.The machine can print, the position of the logo printed or dyed can be adjusted, provided by buyer in advance;

7.Feeding and driving unit: the servo motor controlling the main drive roller to drive fabric to run smoothly, and the force is precisely adjustable.

8.Folding & forming unit: triangle plates with adjustable height and angle to ensure the mask is folded at the center line.

9.Forming & welding unit: ultrasonic welding is firm, the pattern is clear, the welding pressure is adjustable, has a cooling device, and the technical specifica tions are adjustable.

10.Forming & cutting unit: rolling cutter wheel, cutter pad wheel pressure is adjustable, cutter Material: High-speed steel.

11.Leftover separating Unit:Leftover pieces automatically

12.Control system: PLC control and touch screen operating.

六、各部件介绍 Introduction to all parts
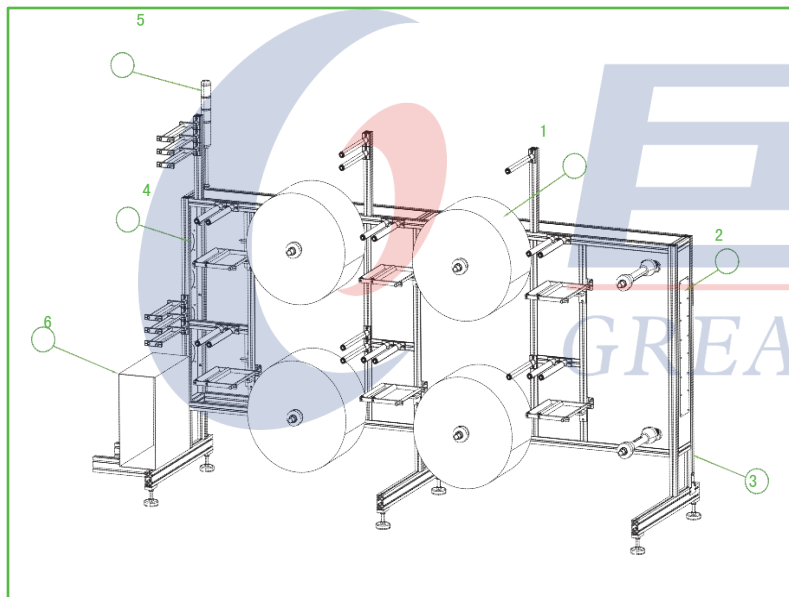
① 布料
布料及安装位

② 进气系统
进气系统，主要用于电气电机散热

③ 铝型架
机架，用于安装功能配件及电机物料

④ 排气系统
用于抽出电机系统热气，避免导致电器 系统发热损坏

⑤ 三色灯
三色警示灯用于提醒系统故障及安全运作

⑥ 料架控制箱
系统控制电箱用于控制整个料架的运作

① Non woven fabric material
fabric and it's holding device

② Air intaking unit
Air in taking unit, mainly used for heat dissipation of electric motor

③ Aluminum rack
Rack for installing functional accessories, motor and materials

④ Exhausting unit
Used to exhaust heat from the motor to avoid heat damaging to the electrical parts.
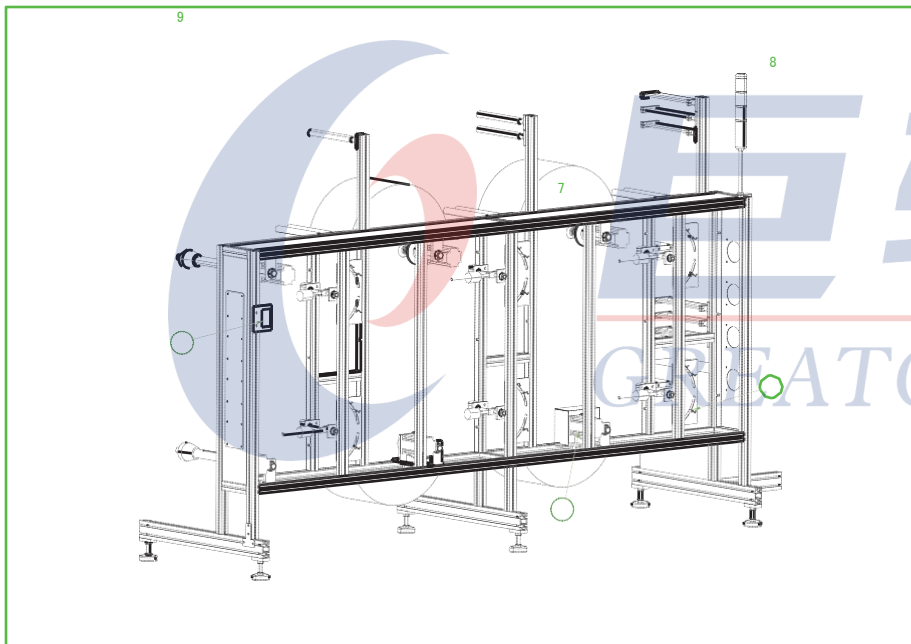
⑤ Three colour warning signal light
Three-color warning signal light is used for warning system failure and operation safety.

⑥ Rack control box
The rack control electric box is used to control the operation of the entire ra

六、各部件介绍 Introduction to all parts

⑦ 步进电机
精准的驱动料架运作

⑧ 张紧机构
控制布料传输的松紧度，避免过
紧或过 松导致故障

⑨ 调速器
控制整个系统的运行速度

⑦ Step–servo motor
Accurately driving material rack running.

⑧ Tension device
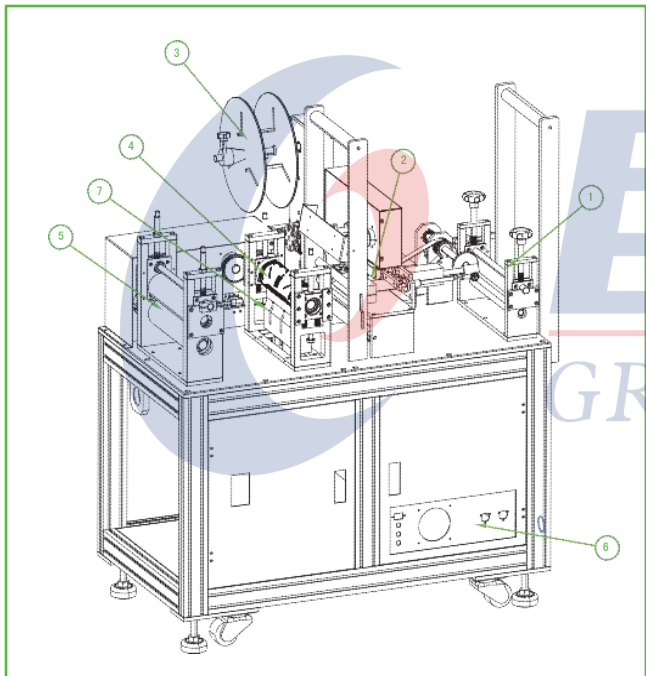Control the tightness of fabric transportation to avoid failure due to too tight or too loose

⑨ Speed adjuster
Control the running speed of the entire system

六、各部件介绍 Introduction to all parts

① 送料辊
传送布料及定位，避免布料错位导致故障

② 鼻梁推进机构
将鼻梁线剪切准确无误的推送入口罩内

③ 鼻梁架
鼻梁线安装装置

④ 齿模
将布料压制为蝶形纹

⑤ 胶辊
将压纹好的布料传输至下道工序

⑥ 超声波电箱
超声波用于控制模钢震动频率来焊压纹 路及封边

⑦ 超声波模钢
以震动频率来焊压纹路及封

① Feeding roller
Transporting fabric and positioning to avoid malfunction caused by fabric misalignment

② Nose bridge bar propulsion device
cutting,transmitting and positioning accurately the nose bridge bar.

③ Nose bridge device
Nose bridge bar installation device

④ Moulding device
Pressing the fabric into a butterfly pattern

⑤ Plastic roller
Transporting the patterned fabric to the next process
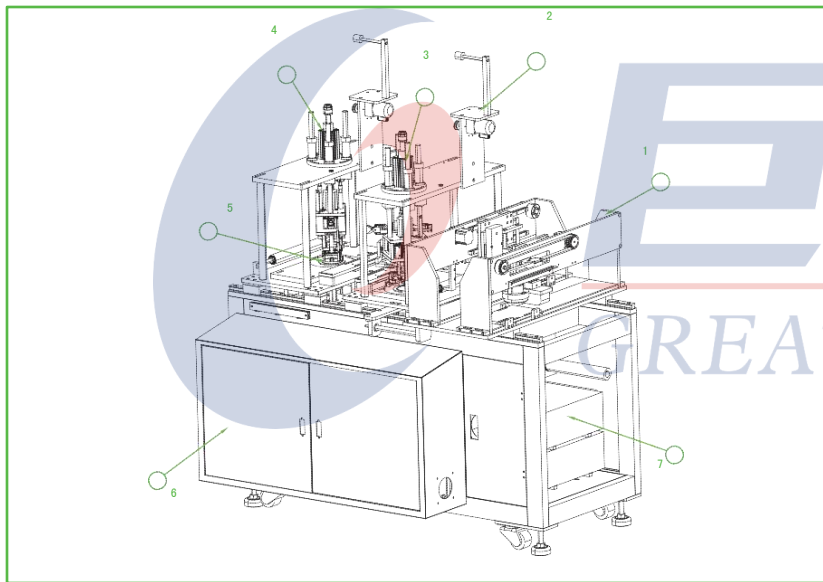
⑥ Ultrasonic electric box
Ultrasound is used to control the vibration frequency of the steel mould for patterned fabric welding and edge banding

⑦ Ultrasonic steel mould
for patterned fabric welding and edge banding through controlling of vibration frequency.

六、各部件介绍 Introduction to all parts

① 移印机
主要作用为移动印刷logo及参数说明

② 耳带线输送架
将耳带线精确的输送至剪切及焊接系统

③ 气缸
推动剪切及焊接系统

④ 气缸
推动剪切及焊接系统

⑤ 超声波模钢
以震动频率来焊接耳带线

⑥ 电柜箱
系统控制电箱

⑦ 超声波
超声波用于控制模钢震动频率来焊接及封边

① Motional Printing device
For printing logo and parameter.

② Ear cord transporting rack
For accurately transporting the ear cord to the cutting and welding devices.

③ Cylinder
Driving the cutting and welding devices

④ Cylinder
Driving the cutting and welding devices

⑤ Ultrasonic steel mould
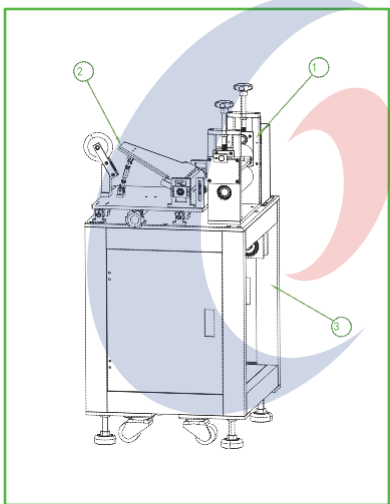Welding ear cord through controlling of vibration frequency

⑥ Electric box
System control electric box

⑦ Ultrosonic
Ultrasound is for controlling the vibration frequency of the steel mould to weld patterned fabric and edge banding

六、各部件介绍 Introduction to all parts

① 送料辊
将焊接好的布料传送至下道工序

② 折叠机构
将口罩展开布料折叠成形

③ 传动机构
电机传动系统用于高精准高效率
的控制 运作位置

① Feeding roller
Transporting the welded fabric to the next process
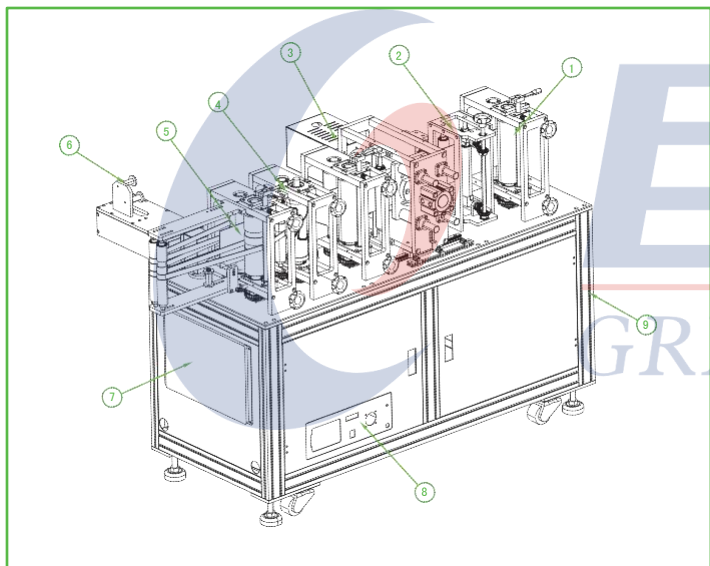
② Folding device
Folding and shaping the fabric

③ Transmission device
For controlling the operating with high precision and efficiency

六、各部件介绍 Introduction to all parts

① 合片
将折叠好的口罩合叠传送至下道工序

② 送料辊
将成形好的口罩传送至下道工序

③ 超声波
超声波用于控制模钢震动频率来剪切口罩

④ 滚切刀
将折叠成形的口罩切断

⑤ 出料辊
将剪切好的口罩送出

⑥ 废料辊
将多余的废料整齐缠绕回收

⑦ 散热窗
散热系统将机箱内的热气排出

⑧ 超声波
超声波用于控制模钢震动频率来剪切口罩

⑨ 基础支架
铝型材机架用于固定安装配置及电气

① Plying device
Plying and transporting to the next process.

② Feeding Roller
Transporting the formed fabric to the next process

③ Ultrasonic
For controlling the vibration frequency of the steel mould to cut fabric

④ Hub cutter
Cutting off the fabric to formed masks

⑤ Discharging roller
discharging the cut masks

⑥ Leftover roller
Rolling for recycling the leftovers

⑦ Heat dissipation window
Exhausting the hot air to outside of the chassis.

⑧ Ultrasonic
Ultrasound is used to control the vibration frequency of the steel mould to cut masks

⑨ Base frame
Aluminum frame is used for installing and holdingdevices.

七、设备技术参数

1）生产效率：30ppm（与材料拉伸性能相关）

2）对折对称度：+/-1㎜；

3）设备故障率:2%（指设备自身产生的故障)

1）Productivity： 30pcs/min（related to fabric's tensile performance)

2）Folding symmetry： +/-1mm；

3）Failure rate:2%（itself failure)