DRLQ SERIES BELT VULCANIZING MACHINE

INSTRUCTION MANUAL

WUXI FUDA MACHINERY MANUFACTURING CO., LTD.

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I. BRIEF INSTRUCTION

The DRLQ series belt vulcanizing machine (hereinafter referred to as vulcanizer) is an electrothermal type vulcanizing device used for on-site bonding of conveyor belts. With the advantages of advanced technology, compact structure and convenient usage, it's used for the vulcanized bonding of the belts mixed with canvas, nylon, steel cord, etc., and it's also suitable for the flame retarded, corrosion proof and other special belts. The application area of this kind of vulcanizer is very wide, it can be used in metallurgy, mining, power plant, port and wharf, building material factory, chemical factory and so on. In a word, as long as the place is without explosive and corrosive gas, the vulcanizer can be used there.

The main parts of this vulcanizer is made of aluminum alloy, which results in smaller volume, lighter weight, and easier carrying. And the electrothermal components are of multilayer structure, connected by three-phase electric circuit at voltage 380V/660V (or customized from 220V~660V). It works stably and reliably on small current. The heating plate shell is made of aluminum alloy, with low thermal inertia and directivity, can make better surface heating temperature uniformity. During the working time of the heating plate, from warming to vulcanizing, the time and temperature are both controlled by the control box. It ensures low energy consumption, high efficiency, convenient operation, reliable work, and good vulcanization quality. The type of the pressure device is hydraulic pressure plate, its structure is simple and the maintenance is convenient. It can make large and even pressure during vulcanization.

As you know the quality of the belt joint directly affects the connection strength and working life of the belt, and also the working efficiency of the conveyor. Therefore the vulcanizer plays a very important and indispensable role in the installation of the conveyor belts, especially for the longer and stronger conveyor belts (such as belts with nylon or steel cord in). Our DRLQ vulcanizer can meet all your requirements and become the reliable tool in your work.

II. TECHNICAL SPECIFICATIONS

With the increase of the conveyor belt width, the heating plate and pressure plate has to be lengthened to fit. With the increase of the vulcanizing pressure, the aluminum frame has to be heightened to fit. It causes inconvenience for using and moving.

In view of this, there're two kinds of structure for DRLQ vulcanzier for our clients to choose.

(1) Vulcanizer with whole piece heating plate and whole piece pressure plate

1. Plane graph of structure (the pressure plate is similar to heating plate)

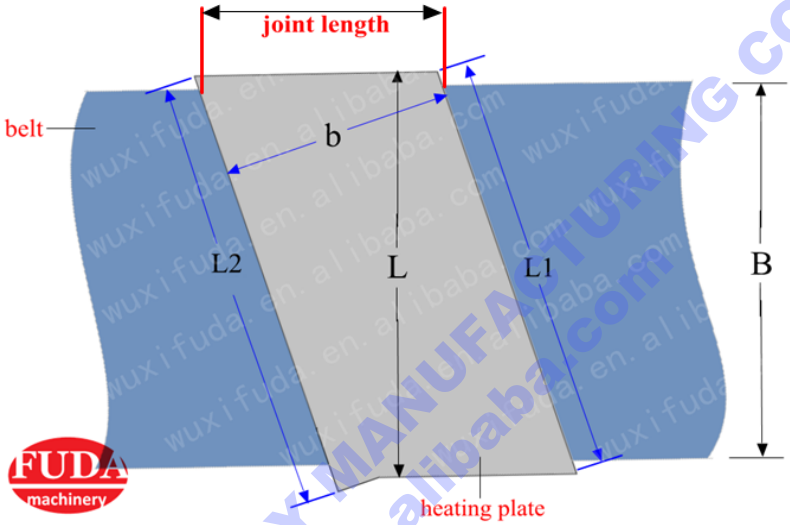

Fig 1

(2) Vulcanizer with combined heating plates and combined pressure plates

1. Plane graph of structure (the pressure plate is similar to heating plate)

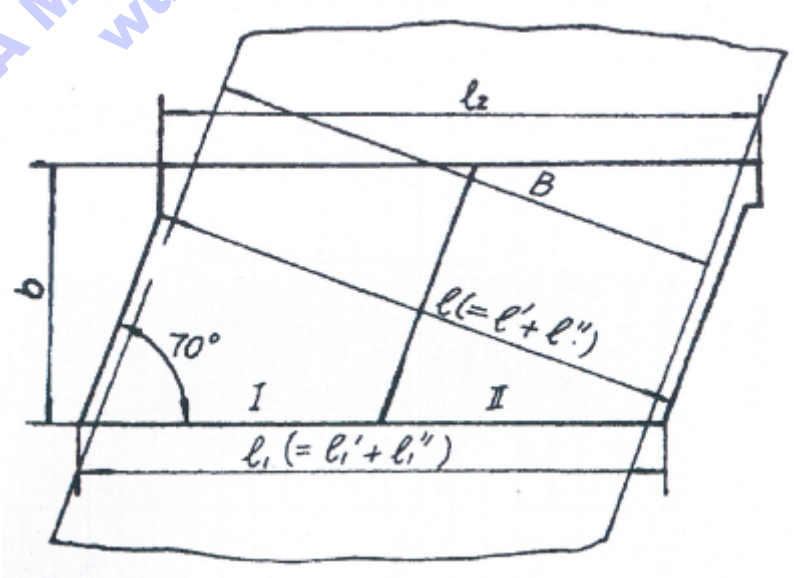

Fig. 2

It's important to know about the joint length for choosing suitable machine size

Specifications of DRLQ series Belt Joint Vulcanizing Machine									
Model number	Belt width (mm)	Plane dimension of heating plate (mm)				External dimension of the whole machine (L×W×H) (mm)	Power (KW)	Weight (kg) only for machine	
	B	b	L	L1	L2			Heaviest piece	Total weight
DRLQ-650	650	500	748	796	826	1212×500×580	6.3	30	240
		670				1303×750×580	9.36	47	385
		830				1332×830×580	10.44	59	450
		1000				1394×1000×580	12.6	74	567
DRLQ-800	800	500	988	1051	1081	1472×500×580	8.4	40	287
		670				1563×750×580	12.48	58	450
		830				1592×830×580	13.92	70	515
		1000				1654×1000×580	16.8	88	645
DRLQ-1000	1000	500	1108	1179	1209	1602×500×580	9.45	47	424
		670				1693×750×580	14.04	68	665
		830				1722×830×580	15.66	83	756
		1000				1784×1000×580	18.9	104	944
DRLQ-1200	1200	500	1348	1435	1465	1857×500×725	11.55	57	500
		670				1948×750×725	17.16	80	770
		830				1977×830×725	19.14	101	884
		1000				2039×1000×725	23.1	126	1100
DRLQ-1400	1400	500	1588	1690	1720	2122×500×725	13.65	65	546
		670				2213×750×725	20.28	90	830
		830				2242×830×725	22.62	113	957
		1000				2304×1000×725	27.3	140	1185
DRLQ-1600	1600	500	1708	1818	1848	2252×500×765	14.7	72	782
		670				2343×750×765	21.84	100	1195
		830				2372×830×765	24.36	126	1367
		1000				2434×1000×765	29.4	156	1690
DRLQ-1800	1800	500	1948	2073	2103	2527×500×865	16.8	82	851
		670				2618×750×865	24.96	115	1296
		830				2647×830×865	27.84	143	1480
		1000				2709×1000×865	33.6	176	1825
DRLQ-2000	2000	500	2188	2328	2358	2802×500×895	18.9	94	959
		670				2893×750×895	28.08	130	1455
		830				2922×830×895	31.32	162	1660
		1000				2984×1000×895	37.8	199	2042
DRLQ-2200	2200	500	2308	2456	2486	2932×500×895	19.95	101	1070
		670				3023×750×895	29.64	140	1620
		830				3052×830×895	33.06	174	1849
		1000				3114×1000×895	33.99	214	2273
For larger sizes such as DRLQ-2400~3600, we can also produce. And we provide OEM service. It means we can produce special sizes according to your special requirements.									

(3) Description and explanation

1. For the Model number DRLQ-1600 to DRLQ-2200, they can be made into two kinds of structures of the plates (whole and combined). And for the others, they can only be made into the structure of whole piece plate. Anyway, no matter whole piece or combined structure of plates, their working performance are all the same. Their difference is only the structure of plates.
2. For the vulcanized bonding of different type belts, it requires different vulcanization pressure. For example, the belts within canvas and nylon requires pressure from 1.0 to 1.3Mpa, but the belts within steel cord requires pressure over 1.5Mpa. Different pressure means the height of frame has to be different accordingly. So it's necessary to tell us the belt type or other detailed requirements before ordering , then we can provide you the most suitable combination.
3. The vulcanizer with voltage of 660V is mainly used in the place requires explosion-proof, such as underground coal mine. For the other occasions it generally requires 380V (or customized from 220V~660V).
4. For some special requirements, such as belt width is more than 2200mm, vulcanization pressure is more than 2Mpa, or any other special requirement of the technical parameter, please tell us before ordering. And the machines will be manufactured accordingly after the technical agreement was signed.
5. There're two kinds of pressure pump provided, electric pump (Model LB-7X10) and manual pump (Model S-SY12.5/4)
6. For the control box, its input voltage is 380V (or customized from 220V~660V), 50Hz, and its output voltage is 380V (or customized from 220V~660V). The output power is 40KW (current 100A), and the standby external power is 220V.
7. The range of the temperature adjustment of the temperature indicator and controller is 0-200°C. The time range of the timer (electronic time relay) is 999 minutes, and 0-60 minutes for use.
8. For the heating plate (electrothermal), the temperature difference of the surface heating is +/-5°C, and the time from warming to vulcanization (145°C) is less than 30 minutes.

III. OUTLINE DRAWING

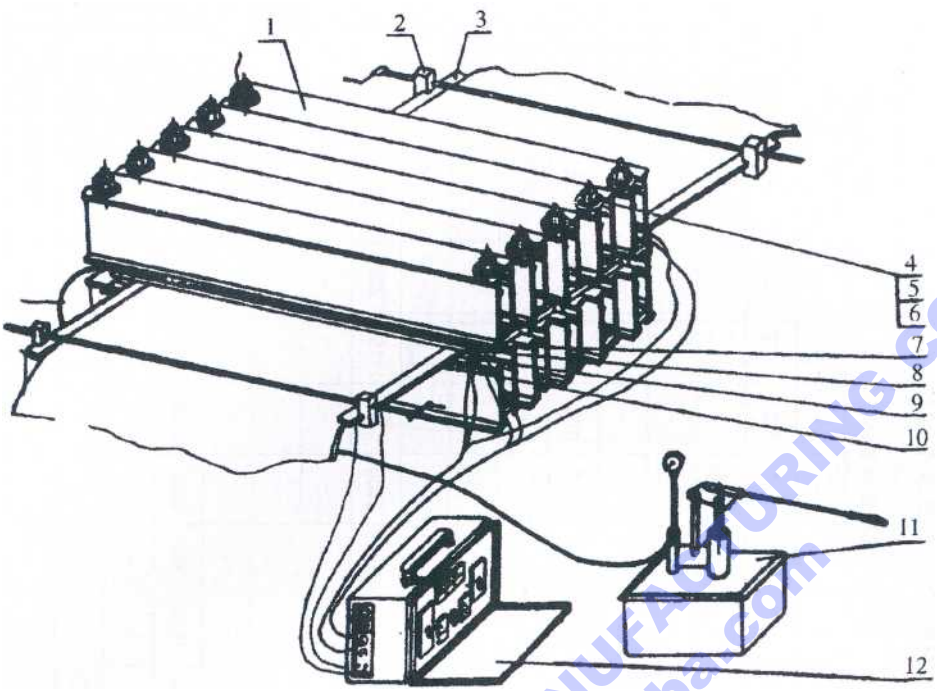

Fig. 3

1. frame
2. clamp device
3. clamp plate
4. bolt
5. nut
6. gasket
7. thermal insulation board
8. upper electrothermal plate
9. lower electrothermal plate
10. hydraulic pressure plate
11. pressure pump
12. electric control box

IV. STRUCTURAL FEATURES OF MAIN COMPONENTS

To do the best vulcanized bonding of the belts, it requires three key elements : best and uniform vulcanization temperature, sufficient and uniform vulcanization pressure, and accurate and reliable vulcanization time. The structure and performance of main components of DRLQ vulcanizer fully meet the requirements as above.

For DRLQ vulcanizer, no matter the structure of plates is whole piece or combined, the main components are the same. There’re electrothermal plates, hydraulic pressure plate, frame, clamp device and clamp plate. And for auxiliary tool, there’re also pressure pump and electric control

box. The structural features of each component are as follows:

1. Electrothermal plate

Electrothermal plate is the heat producer for the work of vulcanizer, and it is the basic component which ensures the realization of the three above key elements. Its plane graph is shown as figure 1 (whole piece) and figure 2 (combined).

The shell of the electrothermal plate is made of aluminum alloy, and there're several kinds of electrothermal components with different power mounted inside. The electrothermal components are divided into three groups (each group with equal power), and connected by three-phase 380V circuit, and then connected to the power socket at the end of the shell. In addition, to shorten the cooling time of the electrothermal plate, the cooling device can be installed into the shell according to clients' requirements.

Using the aluminum alloy to make the shell for electrothermal plate is not only for the advantages of lighter weight and easy moving, but also for the important characteristic of low thermal inertia and heat transfer directivity. And with the rational layout of the electrothermal components, it ensures the electrothermal plate surface works well by faster heat transfer and uniform temperature.

2. Hydraulic pressure plate

The hydraulic pressure plate is the pressure producer for the work of vulcanizer. It's also the basic component which ensures the "three key elements", and its plane shape and size are similar to the electrothermal plate.

The structure of this hydraulic pressure plate is not complicated, it's an easy manufacturing surface pressure device. Laying the nylon rubber sheet on a parallelogram aluminum alloy baseplate, and then seal the four sides by steel plates, screws and nuts, make it be a sealed container. There's a water inlet hole mounted between the rubber sheet and baseplate on one side. And the water will be injected through the inlet hole by hydraulic pressure pump. According to the Pascal's law, in a sealed container the water pressure transmit to all the directions at equivalent value.

3. Frame

Frame is the component used for supporting and clamping during the vulcanization work. It is required to have sufficient strength and rigidity, and it should also have lighter weight for convenient moving. Therefore, the upper and lower frames are all made into combination of single units, and the single units are all the same and interchangeable. The frame is formed by extruding of the aluminum alloy, and it can also be formed through I-steel welding. The structure is shown in figure 3.

4. Clamp plate and clamp device

The clamp plate is made of steel plate, which is 0.5-1mm thinner than the belt, 400-500mm longer than the belt joint, and with the width of 70-90mm. For the clamp device, it's combined by a lead

screw with opposite spiral at the two ends, and two clamping nuts. During the work, the handle at the end of the lead screw can be rotated, to fasten or loosen the clamp plate. See figure 3.

5. Pressure pump

The pressure pump is a device used for injecting high pressure water into the hydraulic pressure plate. Its main components includes pressure pump, high pressure hose and quick joint. For DRLQ vulcanizer, it's normally equipped with electric pump (Model LB-7X10) or manual pump (Model S-SY12.5/4).

6. Electric control box

The electric control box is a device used for time control and automatic control of vulcanizing temperature during the vulcanization. It's also the power supply for upper and lower electrothermal plates, and other external devices. Regarding the operation details, please consult the operation manual of electric control box.

V. ASSEMBLY

1. Before assembly, all main components of vulcanizer (such as electrothermal plate, hydraulic pressure plate, frame and so on) should be separated. And they will be delivered to the work site in time.
2. The separated components are frequently transported, and generally the heaviest component can be moved by two adults. So it's convenient for assembly and disassembly.
3. A commodious site should be chosen from the assembly line of belt conveyor before assembly. It requires enough area and space for operating, place to put the belt, and convenient connecting to power supply.
4. And before assembly, some upper belt conveyor idlers needs to be removed. And there need to be work platform set up by square timber as figure 4. In case of vulcanized bonding outdoors, a strong rain-proof shed should be set up by canvas around the work platform.

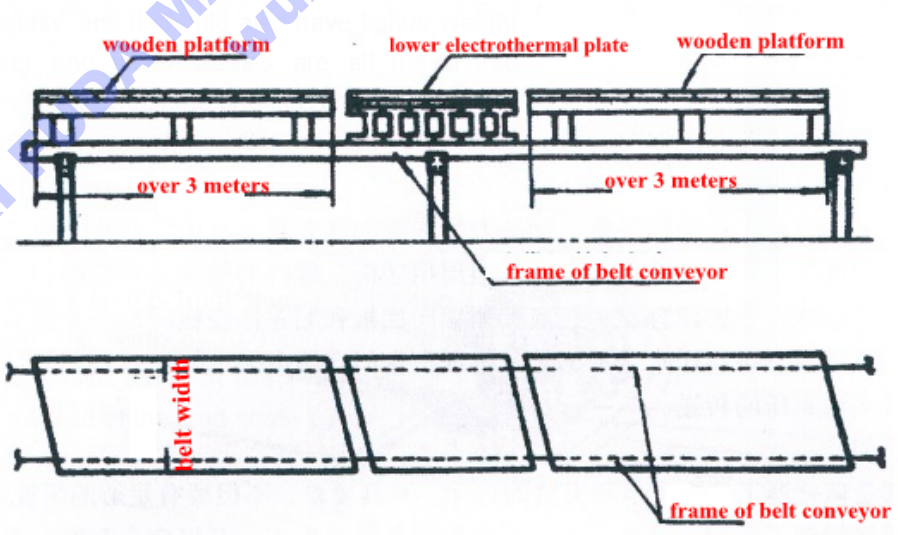

Fig. 4

5. The tools for assembly of vulcanizer, tools for preprocessing of belt joint, and power supply

wires should be prepared. And the valid date of the bonding materials (such as cover rubber, core rubber and rubber cement), manufacturer and production date should be checked in advance.

6. The assembly procedure of the vulcanizer is as follows:
(1) Single lower frames are placed according to figure 5

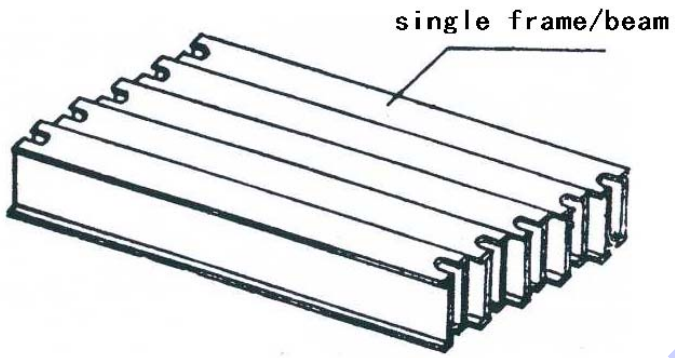

Fig. 5

(2) As shown in figure 6, the hydraulic pressure plate is placed on the laid-out lower frames firstly, and then the lower electrothermal plate is placed on the hydraulic pressure plate. After aligning of the three parts, cover the lower electrothermal plate with heat resistant plastic film or talcum powder.

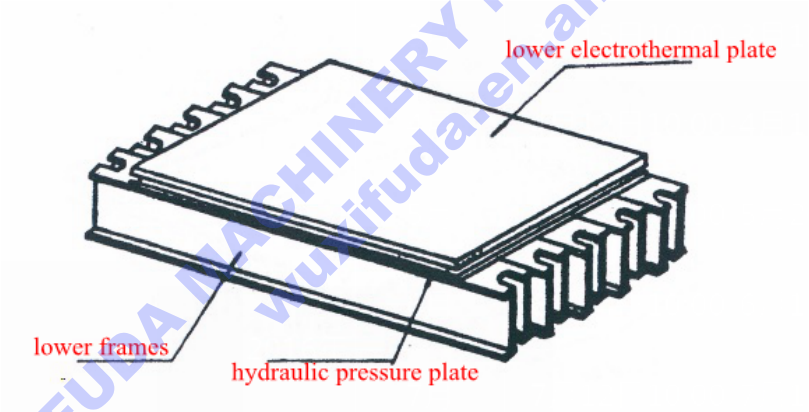

Fig. 6

Note: when several vulcanizers work together side by side, there should be thin (0.5mm) metal sheet fill the gap between the lower electrothermal plates.

(3) After preprocessing and filling of rubber, the belt joint part of conveyor belt is placed on the lower electrothermal plate. And the both sides of the belt are fixed by clamp plate and clamp device, based on the aligning of central axis. See figure 7

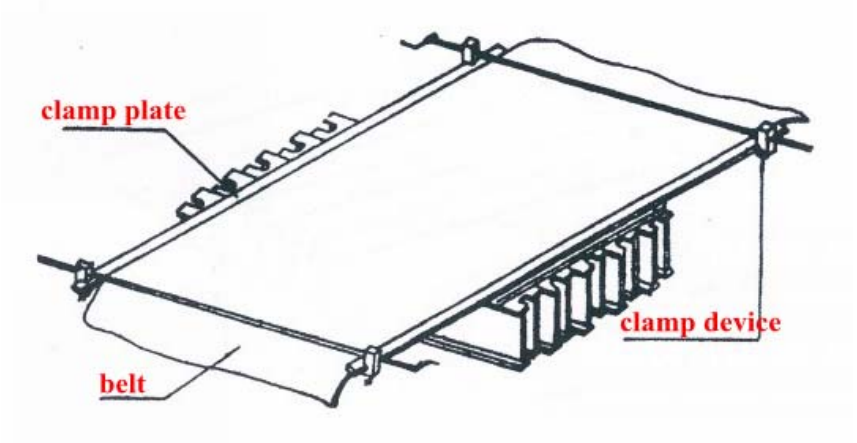

Fig. 7

(4) On the area of the belt joint part which fit the lower electrothermal plate, heat resistant plastic film or talcum powder are paved. And then the upper electrothermal plate and thermal insulation plate are placed on it in sequence, as shown in figure 8.

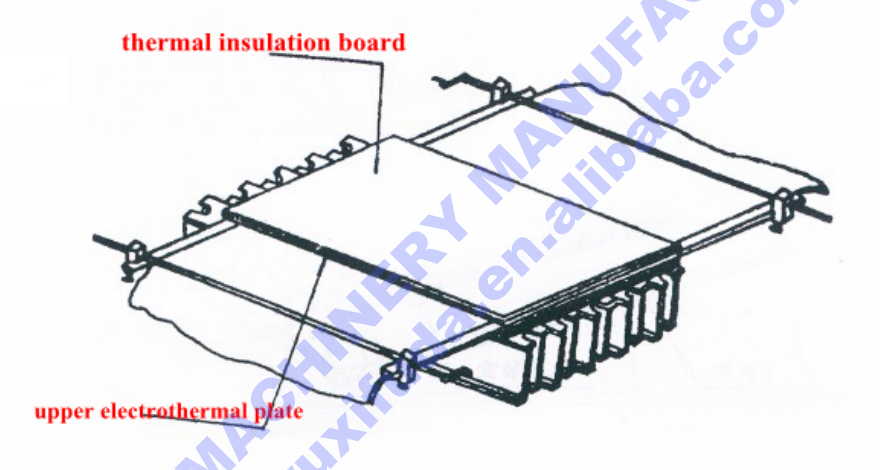

Fig. 8

Note: when several vulcanizers work together side by side, there should be thin (0.5mm) metal sheet fill the gap between the upper electrothermal plates.

(5) As shown in figure 9, the upper frames are placed on the thermal insulation plate, and aligned to the lower frames.

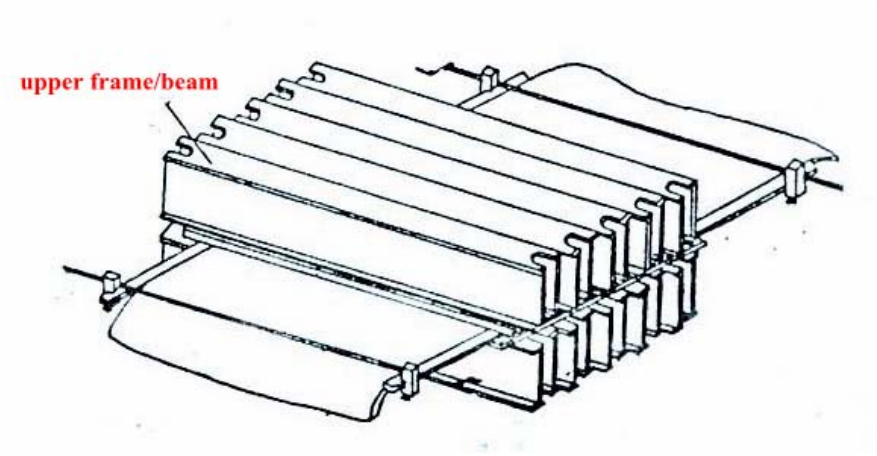

Fig. 9

(6) As shown in figure 10, the pre-tightening bolts, gaskets and nuts are assembled through the oblong notches of the upper and lower frames, and then the nuts should be tightened by spanner. By this time, the assembly of main components of the vulcanizer is finished.

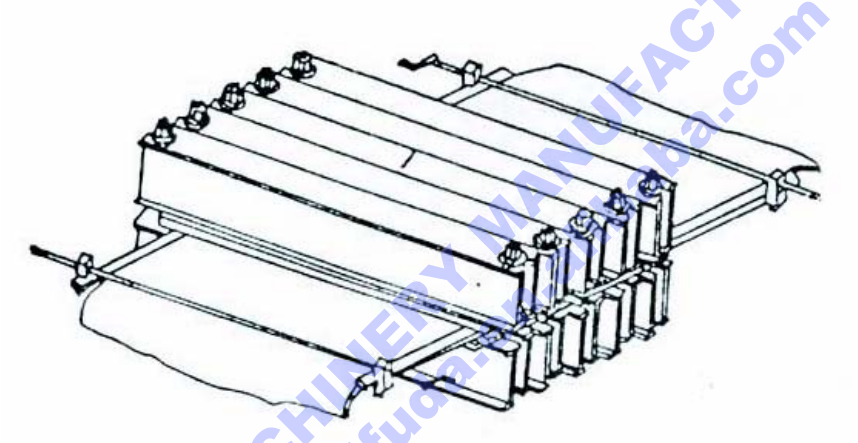

Fig. 10

(7) As shown in figure 3, the quick joint of pressure pump is connected with the water inlet hole of the hydraulic pressure plate. The primary supply lead is plugged into the control box socket properly. One end of the secondary supply lead is plugged into the control box socket and another end is plugged into the electrothermal plates. The thermal resistance lead is plugged into the control box socket, and the sensor at another end is plugged into the thermometer hole of the electrothermal plate. Till now the vulcanizer is completely assembled. And then the operation of pressurization, heating, timing and so on need to be prepared.

VI. OPERATING PROCEDURE

After assembly of vulcanizer, the next operations are as follows:

1. The high-pressure water is injected into the pressure plate by electric pressure pump or manual pressure pump. Stop the injection of water and lock the pump valve when the pressure shown on the pressure gauge reaches the vulcanizing pressure requirement.
2. As shown in figure 1, check the positions of the switches and instruments on the front of control

box, and use them to operate and control the heating, vulcanization, cooling, etc. of the upper and lower electrothermal plates. On the front of the electric control box, there are:

(1) Automatic switch of main power (residual-current circuit breaker)
(2) Temperature indicator and controller for the upper heating plate
(3) Temperature indicator and controller for the lower heating plate
(4) Electronic time relay (timer)
(5) Automatic and manual switches for the upper electric heating plate
(6) Indicator light for the upper electric heating plate
(7) Automatic and manual switches for the lower electric heating plate
(8) Indicator light for the lower electric heating plate
(9) Alarm bell
(10) Spare external power supply switch
(11) Voltmeter
(12) Ampere meter for the upper electric heating plate
(13) Ampere meter for the lower electric heating plate.

3. After the switch for main power (1) is closed, the voltage meter (11) pointer moves and points to the voltage of 380V (or 660V), and the power supply is switched on. At this time, the automatic and manual switches (5) and (7) for the upper and lower electric heating plates are in the closed position.

4. The temperature setting digit on the temperature indicator and controllers for the upper and lower electric heating plates, (2) and (3), is adjusted to the vulcanization temperature (145℃); and the timing digit on the electronic time relay (4) is adjusted to the vulcanization time.

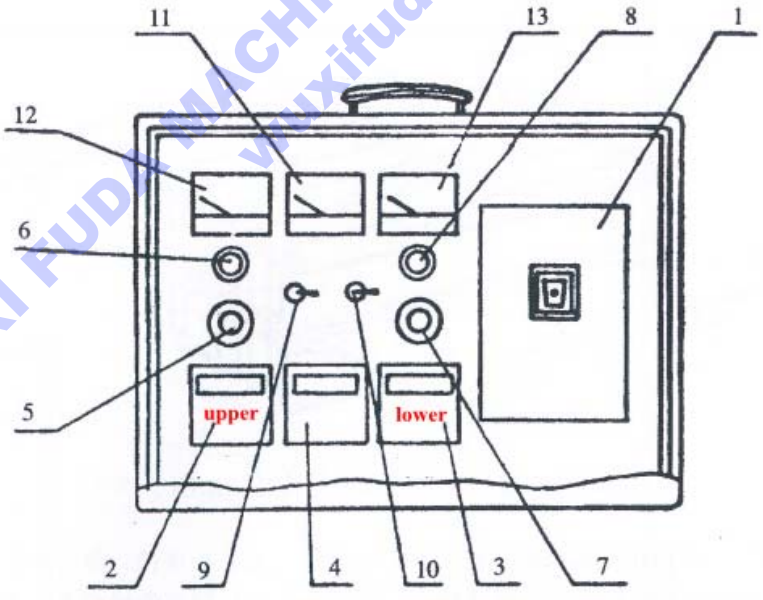

Fig. 11 Diagram of the front of the electric control box

5. The knobs for automatic and manual switches of the upper and lower electric heating plates, (5) and (7), are turnedto automatic position; at this time, the indicator lights for the upper and lower heating plates, (6) and (8), are on; and the pointers of ampere meters for the upper and lower

electric heating plates, (12) and (13), point to the working current value. The indicator lights on the temperature indicator and controller for the upper and lower electric heating plates, (2) and (3), are on, and the temperature display digits gradually increase; and the temperatures of the upper and lower electric heating plates rise.

6. When the temperature indicating digits on the temperature indicator and controller for the upper and lower electric heating plates, (2) and (3), increase to the vulcanization temperature (145°C), the electronic time relay (4) begins to work (at this time, the indicator light starts flashing), and the time display digits gradually increase. At this time, the upper and lower electric heating plates begin to increase the temperature at the range of 145°C±5°C and do the vulcanizing work.

7. When the timing display digit on the electronic time relay (4) reaches the vulcanizing time, the AC contactor in the electric control box actions and cut off the power supply, and the upper and lower electric heating plates stop supplying power. At this time, the alarm bell (9) sounds, and the heating work of electric heating plate ends.

8. Then, the switch for the main power (1) is separated; and the knobs for automatic and manual switches of the upper and lower electric heating plates, (5) and (7), are turned to the middle closed position; and then the primary lead, secondary lead and the lead for thermal resistance (or thermocouple) are pulled down from the corresponding places.

9. When the temperatures of the upper and lower electric heating plates decrease to 100°C, the quick coupling for the pressurized pump system is pulled down from the pressure device to relieve the pressure. And then the pre-tightened bolts and nuts at both ends of the frame are loosened and taken down. The upper frame, heat insulation plate, upper electric heating plate, padding plate and clamping device are removed. The belt joint is lifted up from the lower electric heating plate. And then the overflow glue and rough edge on the belt joint are removed and tidied up. The bonding work of the whole belt vulcanizer ends, and the next operation is prepared.

10. When the temperature indicator and controllers for the upper and lower electric heating plates, (2) and (3), or the electronic time relay (4), fails or is damaged, the knobs for the automatic and manual switches of the upper and lower electric heating plates, (5) and (7), are turned to manual position, and then the upper and lower electric heating plates are supplied power by manual force. At this time, the temperatures can be measured with mercury or double metal thermometer; the stopwatch or watch can be used for timing as emergency measures. In addition, when the electric control box works, the switch for the alarm bell (9) shall be turned on.

VII. USE, REPAIR AND MAINTENANCE

1. The operators shall read the “Operation Manual” before the vulcanizer is used; and in the process of installation and operation, the operator must abide by the procedures regulated in the operation manual.

2. The upper and lower electric heating plates and electric control box are formed through connecting various electrical components and electrical instruments with the wires. So, in the

handling or using process, they must be handled with care to prevent against severe crack, vibration and heavy collision.

3. Before the vulcanizer is used, the operator must be sure to check whether the electric heating parts in the electric heating plate are affected with damp to influence the insulation; otherwise, they must be dried. The operator must check whether the fastening screws and nuts in pressure device are loosened to cause the water seepage or leakage; otherwise, they must be fastened. The operator must check whether the switches and instruments of electric control box are flexible and reliable.

4. In case of joint in the open field, the windproof and rainproof measures shall be taken. After the use, they shall be properly placed through using square wood mat, and the waterproof cloth shall be covered on it to prevent against damage caused by damp and water.

5. When the vulcanizer is not used, it should be placed in the warehouse with good air circulation and relative humidity of not more than 85%. When it is placed, square wood pad must be used; it is not allowed to be placed directly on the ground.

6. If the vulcanizer is not used for a long time, the covers for the upper and lower electric heating plates must be opened and their interior must be dried before use; in addition, tight screws and nuts in the pressure device must be tightened.

VIII. PARTS AND ACCESSORIES

Serial No.	Code	Name		Unit	Quantity	Note
1		Electric control box		*set*	1	380V/660V or customized
2		Primary lead		*set*	1	Power input
3		Secondary lead		*set*	2	Power output
4	S-SY-12.5/4	Manual pressure pump		*set*	1	
5		Pressure gauge		*set*	1	
6		Water pipe		*set*	1	
7		Quick coupling		*set*	2	Including water pipe connector
8		Thermal resistance		*set*	2	Temperature measurement sensor device
9		Ratchet wrench		*set*	2	
10		Clamping device	Left nut, right nut	*set*	1	
			Lead screw	*set*	1 for each	
			clamp plate	*set*	2	
11	LB-7X10	Electric pressure pump		*set*	1	Customized according to customer requirement

Note:

1. Can be with or without inner water cooling system according to customer requirement
2. The clamp plate should be prepared according to the belt thickness and joint length.
3. The metal plate with the thickness of 0.5mm should be prepared by the user.