No. 1

S E R V I C E _ _ _ _ M A N U A L

TUBE SEALER

ACS-152

TERUMO CORPORATION

SECTION 1 GENERAL INFORMATION

This service manual provides knowledge required to repair trouble which may occur with ACS-152.

Section 2 covers the principle of operation. Read this section before starting repairs.

Section 3 shows the trouble shooting flow chart and the diagnosis table of probable trouble.

Section 4 concerns the disassembly procedures of the major components for reference.

Note: (1) Prepare a circuit tester
(2) High voltage power supply is used in this device.

SECTION 2 PRINCIPLE OF OPERATION

Normal operation

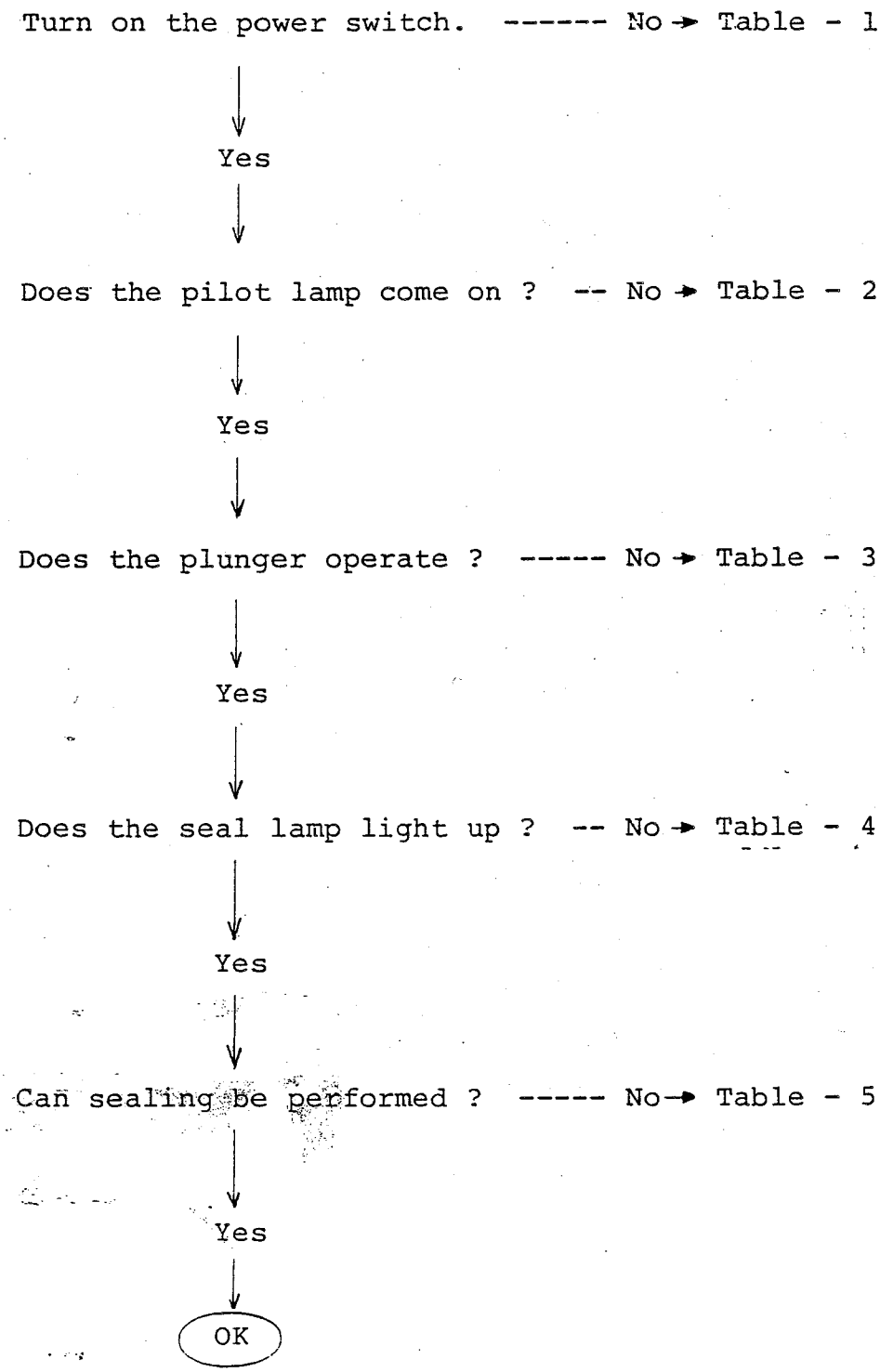
Capacitor C6 is charged through C5 to operate RL1 in the initial phase. When the tubing is inserted between seal electrodes, uS1 operates to drive RL1. At that time, RL2 is also operated by the contact of RL1, and SO(plunger) pinches the tube. With RL1 operated, the vacuum tube operates to oscillated at 40.7 MH_Z. The oscillation output dielectrical-ly heats the tubing to fuse it. When it is fused, an electrode gap is shortened. Then uS2 operates to stop operation of RL1. When operation of RL1 ends, oscillation stops and the fused tubing is cooled. Tubing cooling time is set by discharge of C7 which is connected to RL2. During this cooling time, SO (plunger) which is connected to RL2 pinches the tube.

Operation under abnormal conditions

When the tubing is wet by blood or liquids, high frequency short circuits between the electrodes, thus dielectric heating of the tube is not performed. If the tubing is left under that condition, the vacuum tube can become defective. To prevent this, RL1 operates only for discharge time (approx. 4 seconds), then oscillation is automatically stopped and the plunger is returned to its original position.

Section 3. TROUBLE DIAGNOSIS

3-1 Flow Chart



3-2 Troubleshooting

Table - 1 : Pilot lamp does not come on.

Cause	Check Procedure	Remedy
Power cable is broken down	Check the cable for continuity using circuit tester.	Replace cable
Fuse is broken down		Replace 3-A fuse. Check for fuse opening cause.
Pilot lamp is broken down.		Renew lamp.
Wiring to primary and secondary of power transformer is broken down.	Check 6.3-V terminals of primary and secondary windings of power transformer for voltage.	Repair opening parts.

Table - 2 : Plunger does not operate.

Cause	Check Procedure	Remedy
Safety cover is detached.		Place cover correctly.

Cause	Check Precedure	Remedy
Microswitch is faulty.	Check microswitch for continuity.	Replace microswitch
Relay is faulty.		Replace relay
Power failure.	Check for each voltage.	Repair faulty points.
Diodes D8, D9 and D10 are faulty.	Check them for rectification characteristic.	Replace diodes.

Table - 3 : Seal lamp does not come on.

Cause	Check Procedure	Remedy
Seal lamp is broken down		Replace seal lamp
Relay is faulty.		Replace relay RL2.

Table - 4 : Sealing cannot be correctly performed

Cause	Check Procedure	Remedy
Relay is faulty.		Replace relay RL1.

Cause	Check Procedure	Remedy
Vacuum tube is faulty.		Replace vacuum
Power is faulty	Check for each voltage	Repair fauty points
Between-electrode clearance is improper		Adjust the clearance
Cooling time is deficient	RL2 operation must end approx. 0.5 sec. after RL1 operation has ended	Renew C7

SECTION 4 ELECTRODE ADJUSTMENT

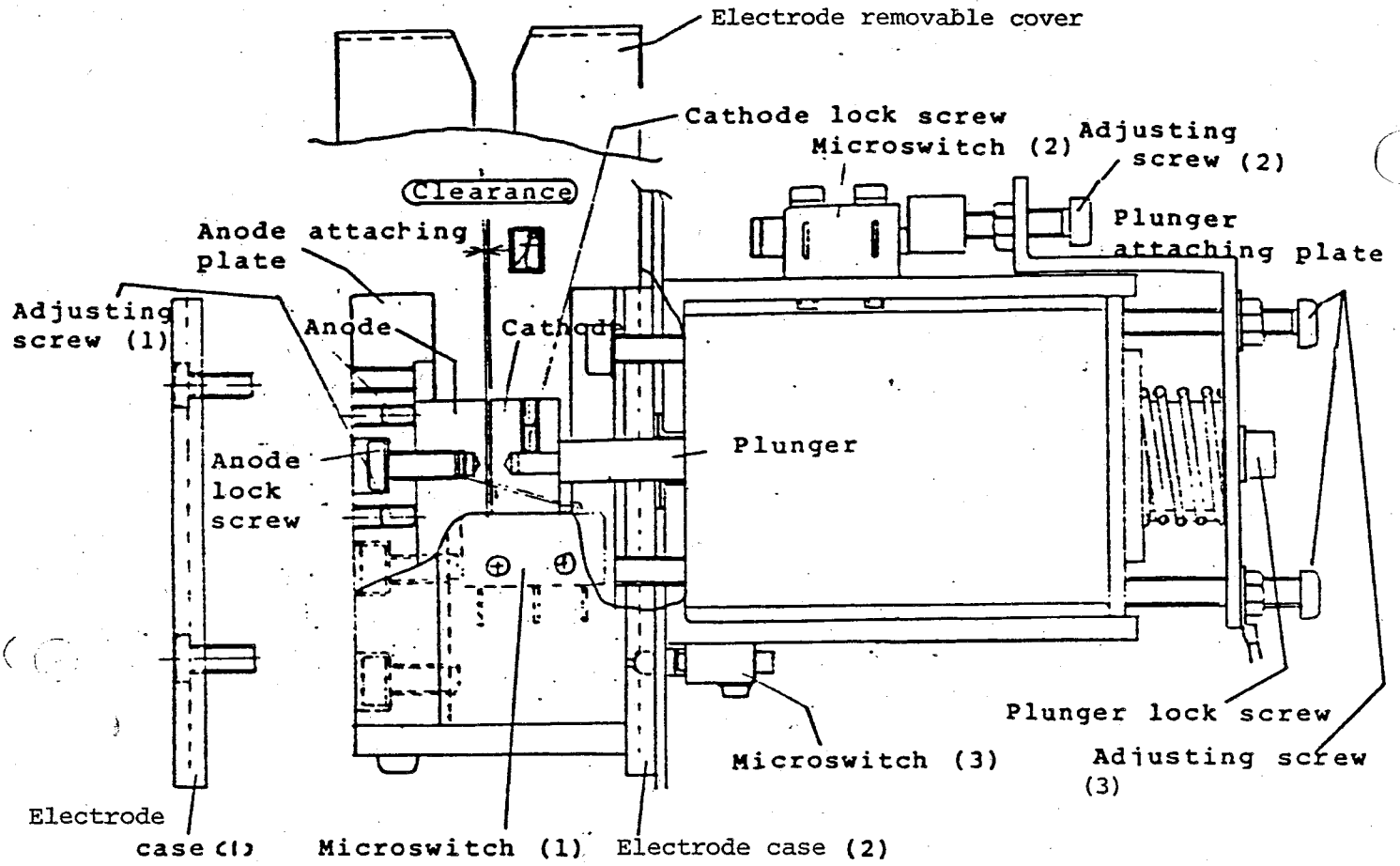
When electrode have been replaced and screws retightened, perform re-adjustment if required.

Note : When adjusting electrode, always unplug the unit. Since there is the potential of shock due to electrical charge in the capacitor, discharge it before performing adjustment.

4-1 Adjustment of Plunger and Cathode

1. Tighten the plunger lock screw. Plunger must move smoothly back and forth. However, the plunger attaching plate and the solenoid should be in goood contact.

2. Firmly tighten lock screws with the cathode and anode being parallel.



4-2 Adjustment of Electrode Parallelism

1. Remove electrode case
2. Slightly tighten the anode lock screw.
3. Keep the cathode from being forced out on the anode side by pushing the plunger.
4. Adjust the electrode parallelism by the adjusting screw(1) while keeping the electrode horizontal. The adjustment will be completed by tightening the adjusting screw previously loosened.
5. After adjustment, tighten firmly the lock screw and lock the adjusting screw.

4-3 Adjustment of plunger stopper

1. Loosen lock nut for adjusting screw (3).
2. Push plunger in until adjusting screw reaches solenoid. At that time, adjust clearance (Tc) between electrodes to 0.04 mm (using a thickness guage) by turning adjusting screw (3).
3. After adjustment, set adjusting screw (3) using a philips screwdriver and tighten lock nut.

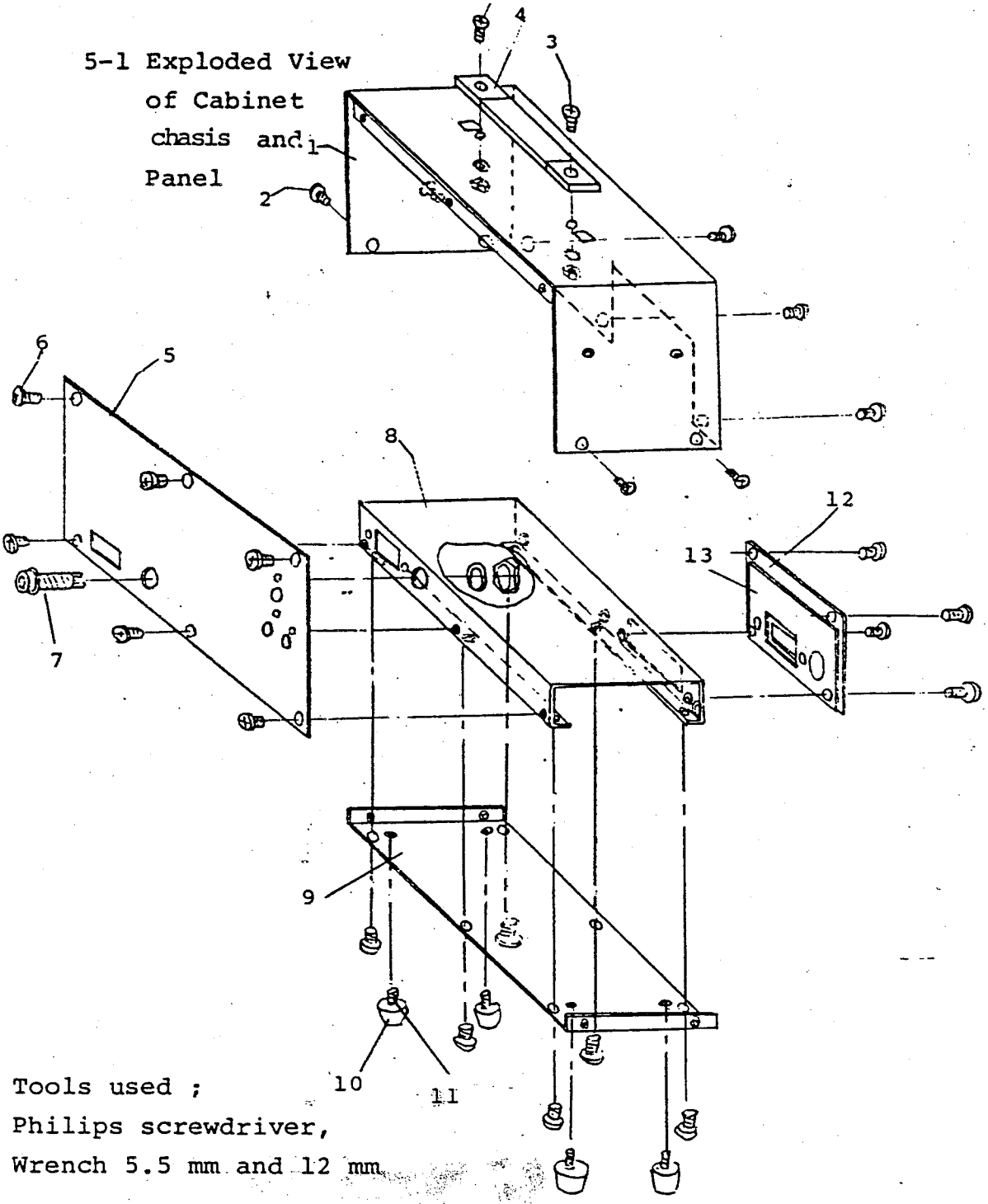
4-4 Adjustment of Electrode Clearance

1. Loosen lock nut for adjusting screw (2).
2. Push plunger in until adjusting screw (2) pushers microswitch and operation is started. At that time, adjust electrode clearance to 0.23 to 0.28 mm (using a thickness gauge) by turning adjusting screw (3).
3. After adjustment, set adjusting screw (2) using a philips screwdriver and tighten lock nut.

Tools used: Philips screwdriver
hex socket wrench for M3
wrench for 7 mm
Thickness gauge (0.04 mm and 0.23 mm)

Section 5 . DISASSEMBLY PROCEDURE

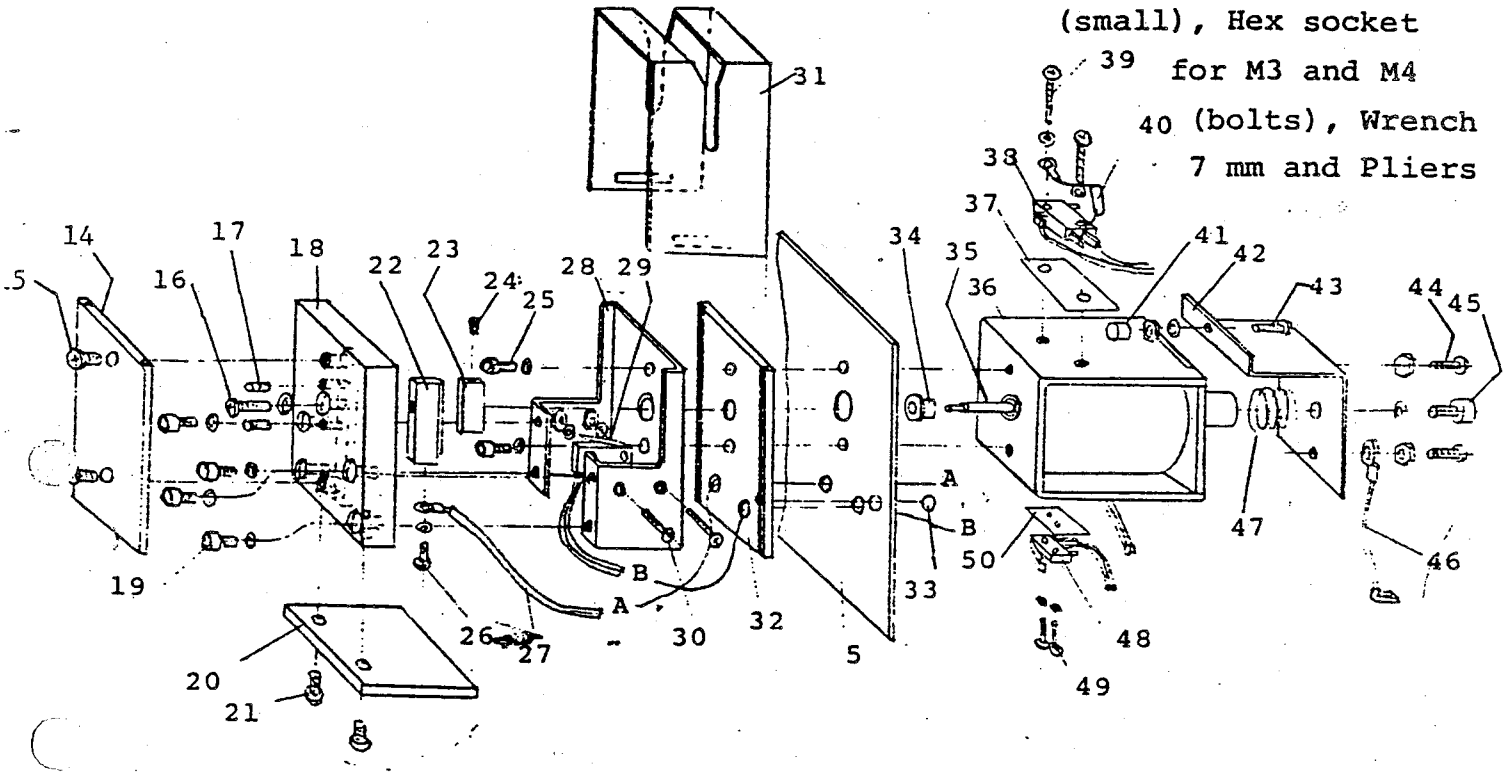
5-1 Exploded View of Cabinet chasis and Panel



Tools used ;
Philips screwdriver,
Wrench 5.5 mm and 12 mm

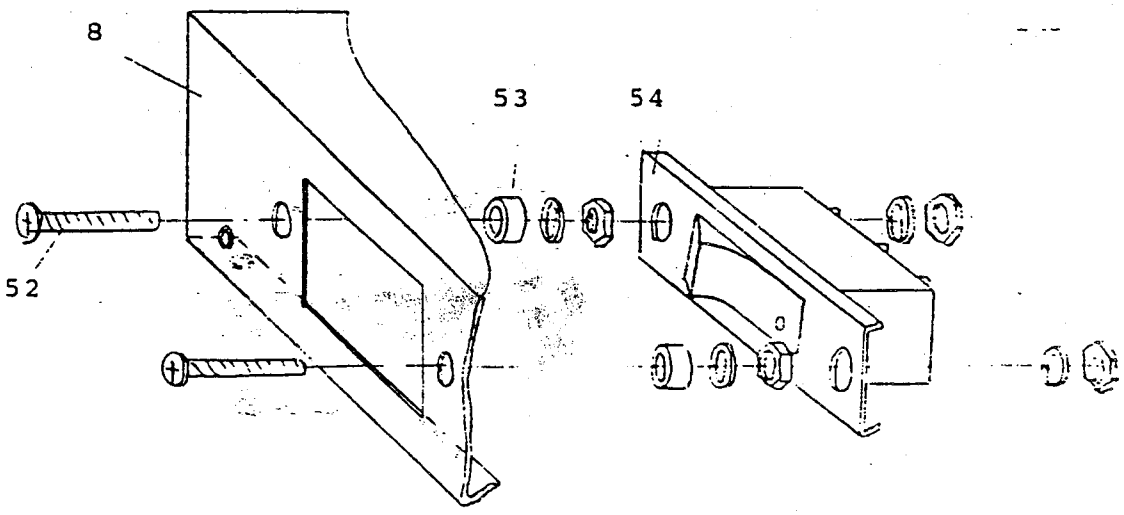
5-2 Exploded View of Electrodes

Tools used ;
Philips screwdriver (small), Hex socket for M3 and M4 (bolts), Wrench 7 mm and Pliers

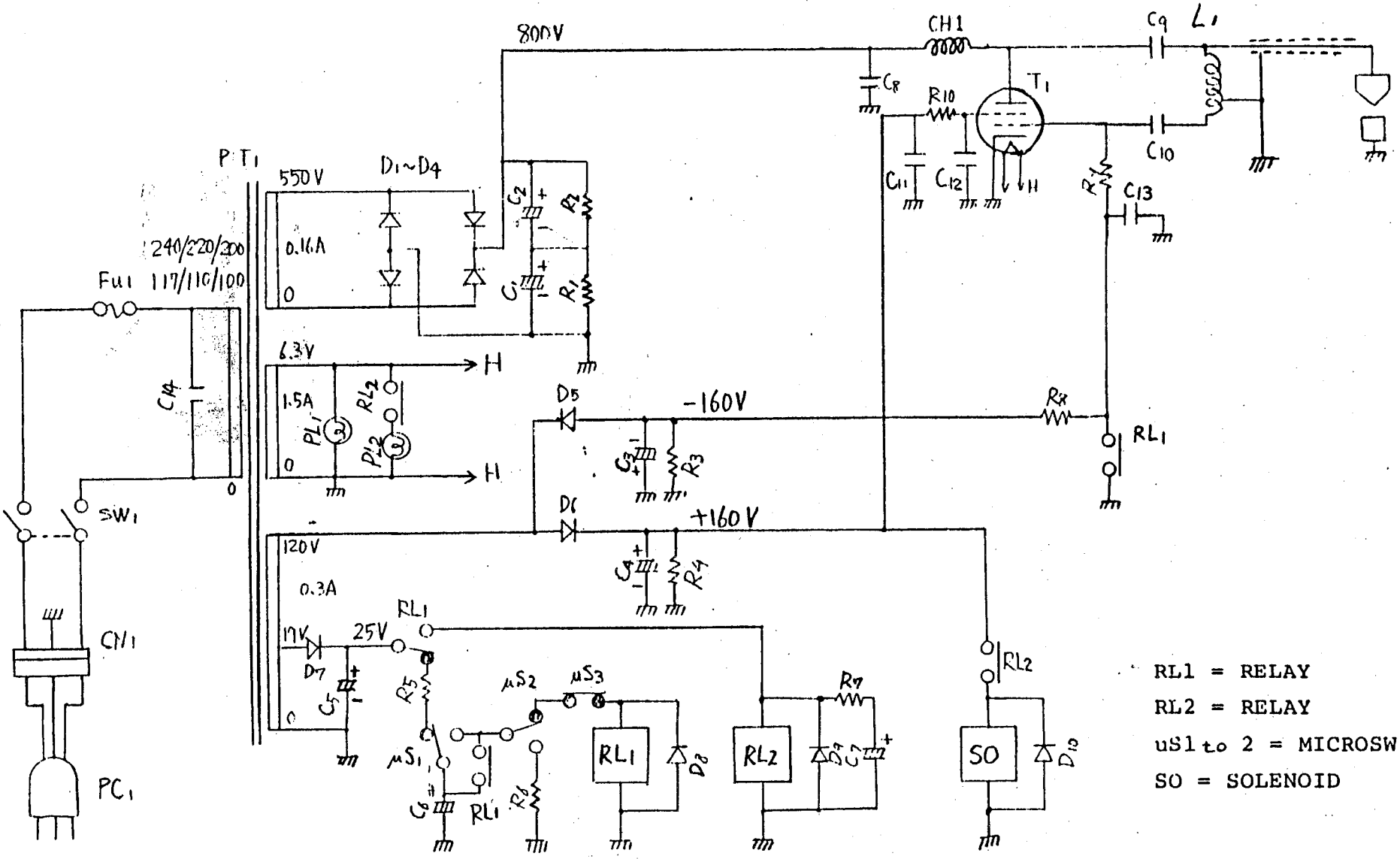


5-3 Exploded View of Power Switch

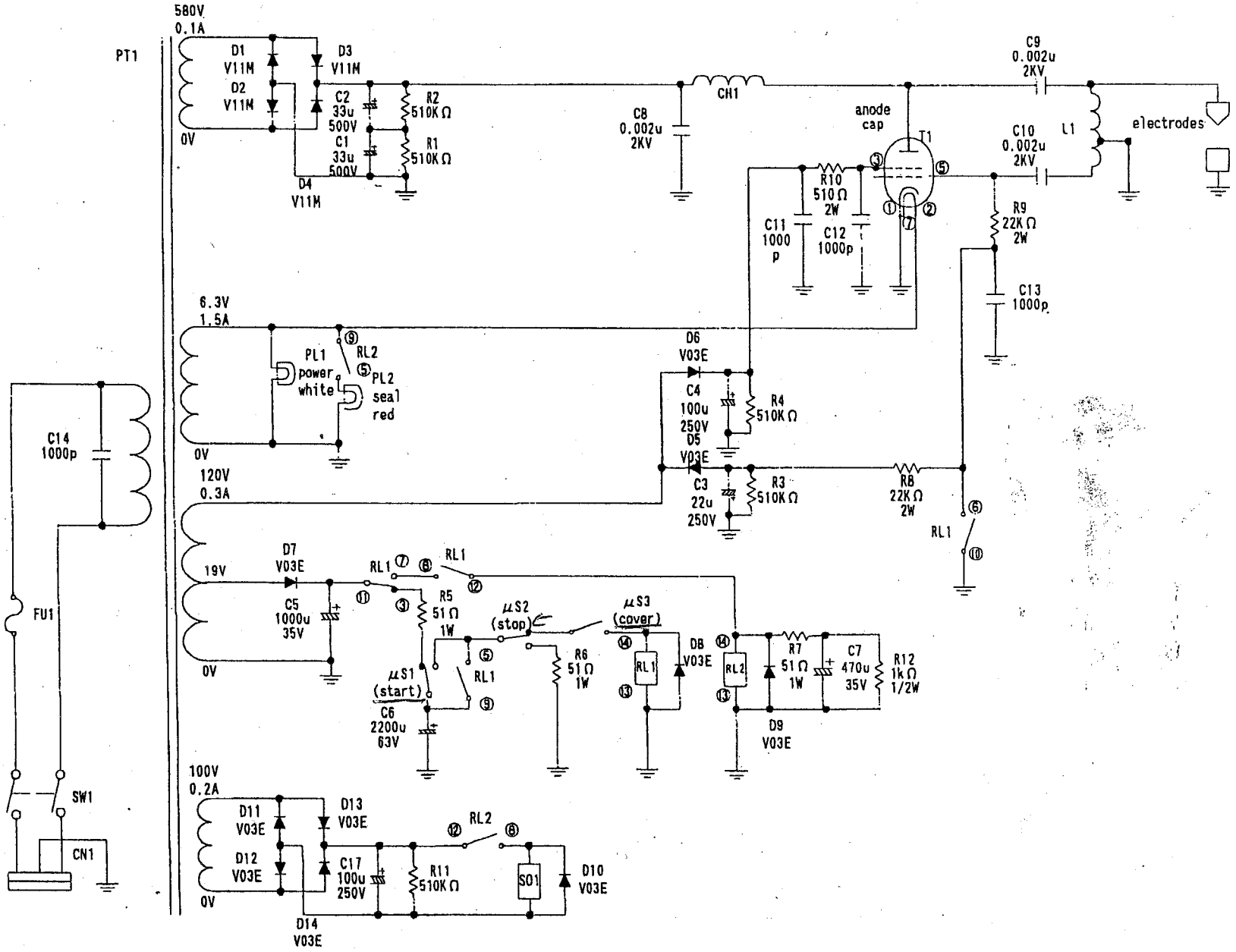
Tools used ; Philips screwdriver and Wrench 5.5 mm



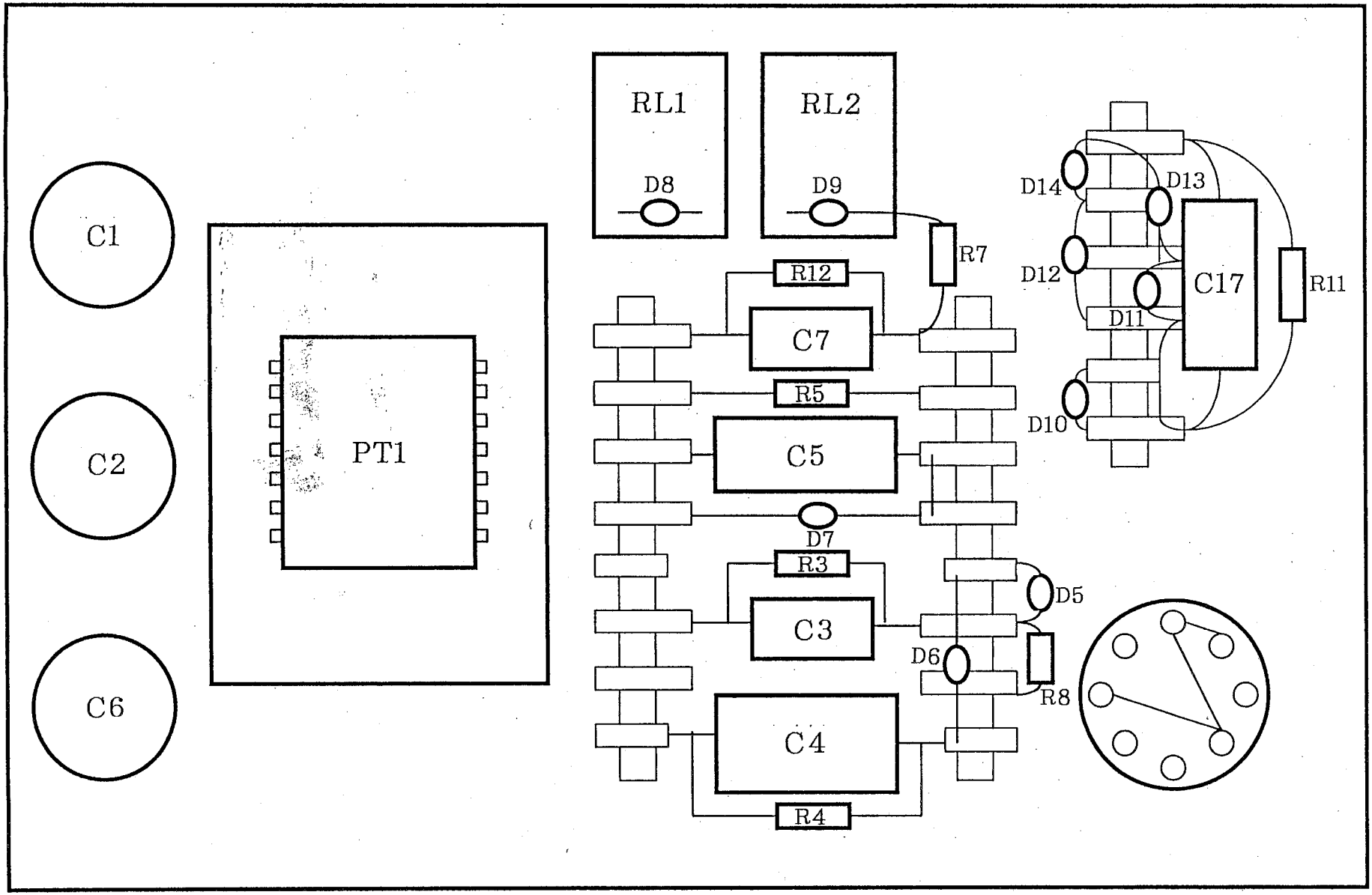
Appendix : CIRCUIT DIAGRAM



VOLTAGE CIRCUIT.
IMPROVED STABILITY TO SOUNDS.



Bottom view


RL1
RL2
D8
D9
R7
R12
C7
R5
C5
D7
R3
C3
C4
R4
C1
C2
C6
PT1
D14
D13
D12
D11
D10
C17
R11
D5
D6
R8

SECTION 6 : PARTS LIST

6-1 Cabinet, Chassis and Panel

Ref. Symbol	Ref. No.	Description	Model No.	Q'ty	Remarks
	1	Cabinet	2 - 252	1	
	2	Cabinet bottom cover and rear panel lock screw	M3 x 0.5 x 6	17	
	3	Handle	H-16, 3555	1	
	4	Handle lock screw	M4 x 0.7 x 12	2(SW, N)	
	5	Panel	3 - 65 (out)	1	
	6	Panel Lock screw	M3 x 0.5 x 8	6	
PL1	7	Power lamp	B6	1(SW, N)	Bulb H-5513
	8	Chassis	2-253	1	
	9	Bottom cover	3-650	1	
	10	Rubber cushion leg	BU692 (B)	4	
	11	Rubber cushion leg lock screw	M3 x 0.5 x 12	4(W)	
	12	Rear panel attaching plate	4 - 1784	1	
	13	Rear panel attaching plate	4 - 1615	1	

6-2 Electrodes

Ref. Symbol	Ref. No.	Description	Model No.	Q'ty	Remarks
	14	Sealer case (1)	4 - 1657	1	
	15	Case lock screw	M4 x 0.7 x 10	2	Plastic
	16	Anode lock screw	M3 x 0.5 x 10	1(SW)	
	17	Adjusting screw	Hexagon M3 x 0.5 x 6	2	
	18	Anode lock screw	4 - 1656	1	
	19	Attaching plate lock screw	Hexagon (M4 x 0.7 x 10)	4(SW)	
	20	Sealer case (3)	5 - 2002	1	
	21	Case lock screw	M4 x 0.7 x 10	2	Plastic
uS1	22	Anode	5 - 2000	1	
	23	Cathode	5 - 1999	1	
	24	Cathode lock screw	Hexagon M3 x 0.5 x 6	1	
	25	Solenoid setbolt	Hexagon M4 x 0.7 x 10	2(SW)	
	26	Cable lock screw	M3 x 0.5 x 6	1(SW)	
	27	Coaxial cable	RG-195 A/U	200mm	Teflon
	28	Anode attaching metal	4 - 1649	1	
	29	Microswitch (1)	SS5GL	1	For start

Ref. Symbol	Ref. No.	Description	Model No.	Q'ty	Remarks
	30	Microswitch lock	M2 x 10	2(SW)	
	31	Sealer cover (2)	4 - 1655	1	
	32	Sealer case plate	4 - 1658	1	
	33	Stainless steel ball for pack		1	Terumo blood bag
	34	Spacer (S)		1	
	35	Plunger		1	
	36	Solenoid		1	4-1659
	37	Insulation tape			Teflon or vinyl
μS2	38	Microswitch (2)	V-1A		For clerance detect-ion
	39	Microswitch lock screw	M3 x 0.5 x 15	2(SW)	
R6	40	Solid resistor	51Ω, 1w		
	41	Regulation nose	5 - 2003		
	42	Plunger attach-ing plate	5 - 1998		
	43	Adjusting screw (2)	M4 x 0.7 x 15	1(N)	
	44	Adjusting screw (3)	M4 x 0.7 x 25	2(SW, N)	
	45	Metal lock bolt	Hexagon M4 x	1(SW)	
	46	Ground wire-netting	0.7 x 10	200mm	
	47	Spring	5 - 2005	1	
μS3	48	Microswitch (3)	SS5GL-13	1	For safety
	49	Microswitch lock screw	M2 x 10	2(SW)	
	50	Insulation tape			Teflon or vinyl

6-3 Switch

Ref. Symbol	Ref. No.	Description	Model No.	Q'ty	Remarks
	52	Switch lock screw	M3 x 0.5 x 15	2(SW, N)	
	53	Spacer (PS)	ϕ6 x 0.4 x 5		
	54	Power Switch	EST 156		

6-4 : Others

Symbol	Model No.	Description	Remarks
D1 to D4	VIIM	Silicon rectifier	1000V 0.4A
D5 to D10	V03E	"	400V 1.3A
R1 to R4	510kΩW	Solid resistor	
R5 to R7	51Ω 1W	"	
R8, R9	22kΩ 2W	Metal oxidized film resistor	
R10	500Ω 2W	"	
C1, C2	33μF 500W	Electrolytic capacitor	
C3	22μF 250V	"	
C4	100μF 250V	"	
C5	1000μF 35V	"	
C6	2200μF 35V	"	
C7	470μF 35V	"	
C8 to C10	0.002μF 2kV	Mica capacitor	
C11 to C14	0.001μF 500V	Ceramic capacitor	
RL1	HC-4 DC24V	Relay	
RL2	HC-2 DC24	"	
PT1	4-1641	Power transformer	
PL2	B-6(Red) 6.3V 100mA	Pilot lamp	
T1	S-2001	Vacuum tube	2B46
CN1	PA-125	Inlet	
PC1	P-385-ES-30	Power cable	
L1	402042	Coil	

SERVICE PARTS LIST <TUBE SEALER ACS-152>

Ref.	Order #	Parts Name	Qty	Description	Remarks
7/PL1	05BS29	Pilot lamp (Bracket)	1	B-6(WHITE)E5	
7/PL1	05BS03	Pilot lamp (Bulb)	1	7231(6.3V)	
59/PL2	05BS28	Seal lamp (Bracket)	1	B-6(RED)E5	
60/CN1	05XX14	AC inlet	1	PA125(250V10A)	
62/FU1	05BS38	Fuse holder	1	S-N1301#01	
62/FU1	05BS02	Fuse	1	3A	100～120V
62/FU1	06BS502	Fuse	1	1.5A	200～240V
14	05BS37	Sealer case (1), (2), (3)	1	ACS-152-2A16	set No.14,20 and 32
15	05BS32	Case lock screw	10	M4×L10(plastic)	Crossrecessed screw
21	05BS31	Case lock screw	10	M4×L10	Roulette (knurling) screw
22	05BS261	Anode	1	ACS-152-2A29	
23	05BS271	Cathode	1	ACS-152-2A30	
29/μ S1	05BB01	Microswitch (1)	1	SS-5GL	
31	05BS221	Sealer cover	1	ACS-152-2A19-1	
33	05BS33	Stainless steel ball for bag	10	φ 4.7	Terumo blood bag
34,35,36	05BS12	Solenoid	1	ACS-152-1A02	
37	05BS11	Insulation tape	1		Teflon or Vinyl
38/μ S2	05BS071	Microswitch (2)	1	V-15-1A6	
46	05BS30	Ground wire netting	1		
47	05BS21	Spring	1	ACS-152-2A20	
48/μ S3	05BS06	Microswitch (3)	1	SS-5GL13	
54/SW1	05BS04	Power switch	1	EST-156	
D1 to D4	05BS23	Silicon rectifier	1	V11M	Vrrm=1.3kV If=0.4A
D5 to D14	05BS232	Silicon rectifier	1	V03E	Vrrm=400V If=1.3A
C1 to C2	05BS391	Electric capacitor	1	33 μ F500V	
C3	05BS401	Electric capacitor	1	22 μ F250V	
C8 to C10	05BS17	Mica capacitor	1	0.002 μ F2kV	
CH1	05BS16	Wirewound resistor	1	30 Ω	
RL1	05BS08	Relay	1	HC-4DC24V	
RL2	05BS082	Relay	1	HC-2DC24V	
PT1	05BS192	Transformer	1	ACS-152-1A05	100V～120V
PT1	06BS5191	Transformer	1	ACS-152-1A06	200～240V
T1	05BS13	Vacuum tube	1	6146B	

Ref.	Order #	Parts Name	Qty	Description	Remarks
PC1	05BS01	Power code Cord	1	UC-901-J03	100V～120V
PC1	06BS501	Power code Cord	1	KS31A	200～240V
	05BS09	Socket for relay	1	AP-3844	for RL1
	05BS092	Socket for relay	1	AP3824	for RL2
	05BS10	Anode cap	1	C9-401D	for T1
	05BS14	Socket	1	S-3898	for T1
	05BS15	Coaxial cable	1	RG-195A/U, 200m/m	
	05BS25	Coil	1	L1	
	05BS34	Roulette screw	10	M4×6	
	05BS35	Vinyl cover	1	ACS-152-3A04	
	05BS36	Bag supporting	1	ACS-152-2A21