S	1. 2. 2' 3. 4.
C	6. 7. 5. 34. 9. 37. 8. 10. 3. 15. 11. 4. 2. 12. 27. 46. 13. 1. 48. 38. 45. 44. 43. 42. 41. 40. 18. 17. 22. 19. 20. 14. 24 21. 23. 26. 28. 25. 29. 31. 30. 32. 33. 35. 36. 47. 39.
R	3. 5. 6. 58. 4. 7. 8. 57. 9. 10. 12. 13. 14. 1. 2. 11. 15. 16. 46. 51. 63. 62. 48B. 48A. 48. 20. 21. 23. 47. 25. 24. 17. 19. 22. 26. 27. 28. 49. 29. 33. 34. 18. 31. 61. 35. 38. 32. 36. 59. 39. 40. 42. 37. 41. 45. 44. 60.

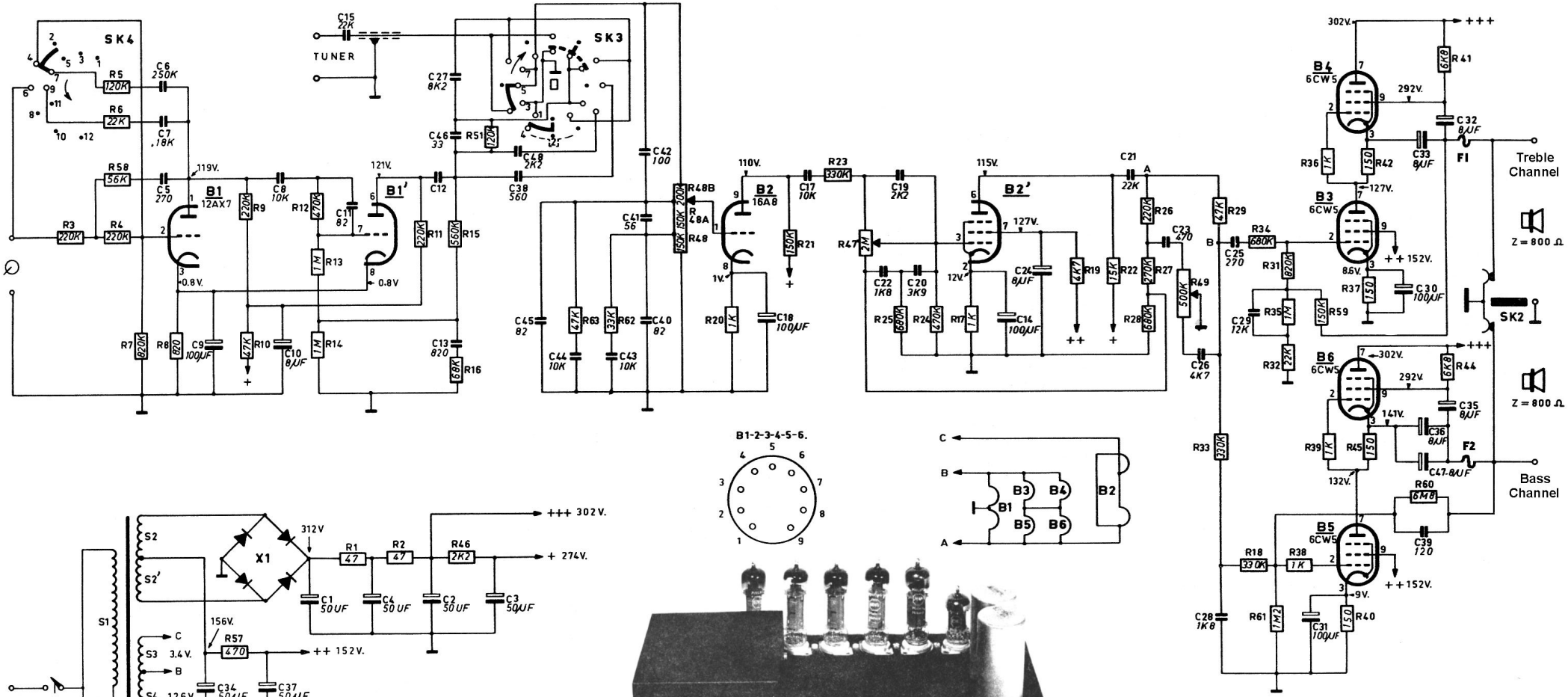
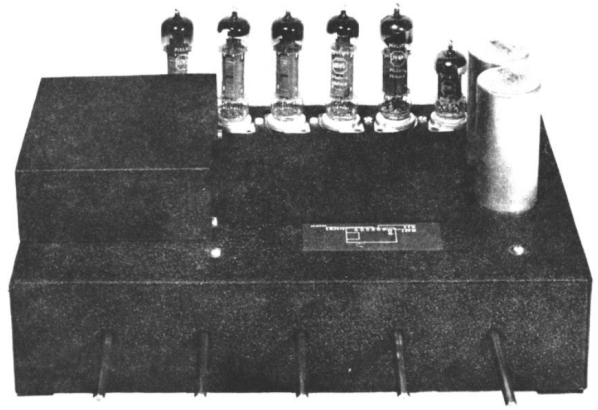


Fig. 7



PHILIPS AG9008-52

Speaker Impedance = 800 ohms

CONTROLS:

From left to right:

1. ON-OFF switch
2. Bass control
3. Volume control
4. Treble control
5. Selector switch

The input is at the rear of the unit switch (SK4).

UPPER POSITION: Magneto-dynamic pick-up

LOWER POSITION: Crystal pick-up

CONSUMPTION AND LINE VOLTAGE: 85 W (117 V-60 cycle).

HUM LEVEL: -60 d b with respect to 6 W + 6 W output.

POWER OUTPUT: Measured across a load resistance of 800+800 Ω.

BASS CHANNEL: 6 Watts at 6% distortion (frequency = 90 c/s)

TREBLE CHANNEL: 6 Watts at 6% distortion (frequency = 4000 c/s).

TUBES:
B1 : 12AX7
B2 : 16A8
B3 : 6CW5
B4 : 6CW5
B5 : 6CW5
B6 : 6CW5

A FEW DETAILS ABOUT THE CIRCUIT DIAGRAM:

The AG9008 is a quality amplifier which amongst other things is suitable for operation with:-

1. Crystal or magneto-dynamic pick-up.
2. Tuner or magnetophone.

The amplifier is equipped with a continuously variable bass and treble control. A switch (SK3) is incorporated for adaptation to 3 recording characteristics.

The amplifier is designed according to the bi-ampli principle.

The output is derived from two single ended push-pull output stages utilizing 2 x 6CW5 tubes for each channel.

The pre-amplifier which drives both output stages via the cross-over filter, employs a 16A8 tube and both bass and treble controls have been incorporated in this circuit.

The cross-over filter has its cross-over point at 450 c/s. (The frequency whereby equal power is developed in each channel).

The input to the (control) driver stage is made up of a double tapped 500 KΩ volume control (R48-R48a-R48b). At low positions of the volume control the high notes as well as the low notes are boosted a little, so that better matching is obtained.

The input to the volume control is applied by the correction switch (SK3) either to the tuner input or via filters to the output of the pick-up correcting pre-amplifier (12AX7).

These filters which consist of R.C. elements compensate for the recording characteristics which differ a few db's from each other.

The correcting pre-amplifier B1 (12AX7) is switchable for magneto-dynamic or crystal pick-up (switch at the rear side of the chassis).

The switch is arranged so that the output voltage is the same for both pick-up types.

The correction for the output voltage of the pick-up as a function of the frequency is such that for the various recording characteristics only a certain attenuation of definite frequency ranges is necessary via the above mentioned filters, in other words, in the circuit around B1 and B1' the maximum required bass and treble of all recording characteristics is corrected.

HUM AND RATTLE:

As selenium cells, which are of very low internal resistance, are used in the rectifying circuit, strong current pulses arise in the supply transformer. These current pulses appear as small voltage pulses in the heater circuit.

Pin 5 of the 12AX7 transfers these pulses to pin 7 (grid B1') via the tube socket capacity, so that a rattle is audible in the treble channel. By coupling the pulses of pin 4 (being in phase opposition) to the pulse of pin 7, via the wiring capacity, this rattle can be removed entirely.

This can be done as follows (if rattle causes trouble).

The filament lead of pin 4 is bent a little towards pin 7, or is pushed a little away from same, so that the rattle becomes nil.

THE SELECTOR SWITCH:

Position 1:

In this position the tuner input is connected through DC blocking condenser C15 (.022 μfd) to the top of the volume control. C15 is necessary because tuners often employ a cathode follower circuit which has a leakage current of a few μA.

The output of the pre-amplifier (12AX7) is shortcircuited across R51, C46 and C27 the junction point being grounded through SK3. Although not a 100% shortcircuit, this is done, because otherwise B1 and B1' could start oscillating at a very low frequency (3-8 c/s) due to cathodes being tied together.

Position 2: (see fig. 3)

In this position the pick-up pre-amplifier unit is connected through C46, R51 to the top of the volume control.

C46 and R51 match the output voltage of the pre-amplifier to the recording characteristic. The input of the tuner is grounded in this position of SK3.

Position 3: (see fig. 4)

C27 is connected in series with C46, R51 and at the same time C38 is connected in parallel with C46, R51.

C27 gives an attenuation of the bass range, C38 boosts the treble range.

The input of the tuner is shortcircuited via C15 in this position.

Position 4: (see fig. 5)

C27 is shortcircuited, so that the low notes are less attenuated; at the same time C38 is replaced by C48 connected in parallel with C46, R51. This boosts the treble range.

The tuner input is grounded via C15.

BASS-CONTROL:

Part of the plate A.C. voltage of B2' is taken from R28 and applied to the grid via C22, C20 and R47.

C22 and C20 have a low impedance for high frequencies, so that the negative feedback for the high frequencies is independent of the position of R47.

C22 and C20 can be overbridged more or less with R47, this has no influence on the high frequencies of the negative feedback signal, but it has for the low ones.

C22 and C20 have a large impedance for low frequencies. If control R47 is in the upper position, the low frequencies receive only a small amount of negative feedback. The result of this is that the low notes are favoured above the rest of the frequency spectrum. When R47 is moved downwards, the negative feedback for the low notes becomes stronger and stronger, so that the low notes become weaker.

If R47 is in the lower position, C22 and C20 are short-circuited, so that all frequencies now obtain an equally strong feedback.

In the lower position of R47 all frequencies receive equally strong feedback, so that the output signal of B2' should be straight.

This is not the case, however, since C19 operates as coupling capacitor in this position.

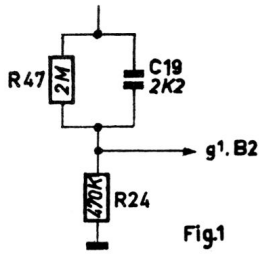


Fig.1

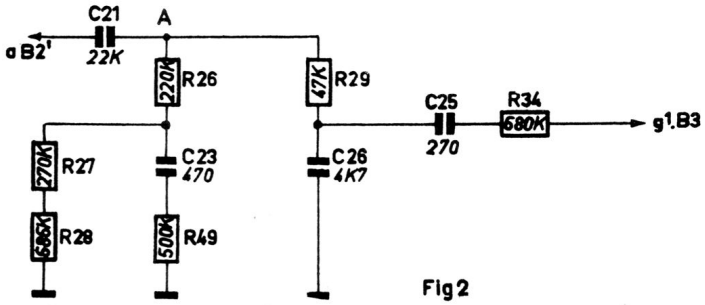


Fig 2

This can be understood as follows: C19 and R47 which are connected in parallel, together form a much greater impedance for low frequencies than R24. (see fig. 1). From this it follows that the low frequencies are attenuated with respect to the high ones.

When R47 is rotated upwards again, the influence of C19 becomes smaller and smaller, so that the low notes are less attenuated.

The influence of the filter C22-R25, C20-R24 becomes greater and greater, as a result of which the high frequencies obtained a stronger feedback, whereby the low notes are favoured.

TREBLE CONTROL:

R49 is the treble control. C23 and R49 (wholly or partially) are connected in paralled with R27 and R28.

For low notes this parallel connection has no influence due to the small capacitance of C23.

B4 and B3 form the output stage for high notes. The necessary control signal is applied to the control grid of B3.

If R49 is in the lower position, we get the situation shown in Fig. 2.

Only the parts which are of importance for this treble control, have been indicated.

We see that the plate A.C. voltage of B2' is between point A and earth. via a parallel and series connection of resistors and capacitors. R29 and C26 form a voltage divider. As the impedance of C26 is much smaller for high notes than the impedance of R29, the high notes will be attenuated. So B3 receives few high notes. As R49 is rotated clockwise, C26 is moved further from ground and part of R49 is connected between ground and C26. The high notes are therefore attenuated less and less. When R49 is in the upper position, the high notes are no longer attenuated.

C23 is now connected in paralled with R27-R28. C23 has a small impedance for high notes with respect to R27-R28.

The negative feedback voltage across R28 is therefore small for high frequencies, in other words, the negative feedback voltage decreases with increase in frequency. The high notes are therefore favoured. The negative feedback voltage reaches the grid of B2' via C22, C20. As R49 goes downwards, a resistor is placed in series with C23, as a result of which the impedance for high frequencies becomes greater and this means that the high frequencies obtain more negative feedback, as a result of which they are less favoured.

THE BI-AMPLI PRINCIPLE:

Here the high and low notes for the output stage are divided, whereby the high notes and low notes each have their own output stage and loudspeaker(s).

At point B in the circuit diagram all frequencies are still present. B3 is controlled via the filter C25-R34-R31-R35-R32-C29.

The above filter attenuates the low notes very strongly, so that B3 and B4 receive only high notes.

B5 is controlled via R33-C28 and R18-R61 and R38. The combination R33-C28 attenuates the high notes very strongly, B5 and B6 therefore only receive the low notes.

B5 and B6 form, just like B3 and B4, a so-called single ended push-pull circuit, the working of which will be explained later on.

B3 and B4 obtained negative feedback via R59 in the grid circuit of B3, while B5 and B6 obtain negative feedback via R60-C39 in the grid circuit, and this reduces distortion.

SINGLE ENDED PUSH-PULL CIRCUIT:

As B3 and B4 operate in the same manner as B5 and B6, the working of B3 and B4 only, will be discussed here (see fig. 6).

Only the most essential components have been shown.

B4 and B3 are connected in series. If no signal is applied to B3, the plate currents are therefore of equal value.

The cathode resistors are also equal, so that the tubes have the same bias.

If we suppose that the grid of B3 obtains a negative pulse at a certain moment, the tube current of B3 decreases. The voltage across R42 therefore becomes smaller.

From this it follows that the grid voltage of B4 also becomes smaller and the plate current of B4 therefore becomes greater.

Via C33 and the loudspeaker a current will flow which is equal to the difference of the momentary values of Ia4 - Ia3. (Ia4 = plate current of B4) (Ia3 = plate current of B3).

The above follows from the first law of Kirchhoff, which states: "The algebraic sum of the instantaneous values of all currents at a definite point (here point S) is zero at every instant".

PARTS LIST

Cir. Ref.	Description	Part No.
S1	)	
S2	)	A3 142 82.0
S3	)	
S4	)	
C1	50 µF)	
C2	50 µF)	AC 548 0/50+
C34	50 µF)	50 + 50
C3	50 µF)	
C4	50 µF)	AC 548 0/50+
C37	50 µF)	50 + 50
C5	270 pF	A9 999 04/270E
C6	0.27 µF	A9 999 06/V270K
C7	18000 pF	A9 999 06/18K
C8	10000 pF	A9 999 04/10K
C9	100 µF	A9 999 09/B100
C10	8 µF)	
C24	8 µF)	A9 999 11/P8+8
C11	82 PF	A9 999 04/82E
C12	22000 pF	A9 999 04/22K
C13	820 pF	A9 999 04/820E
C14	100 µF	A9 999 09/B100
C15	22000 pF	A9 999 04/22K
C17	10000 pF	A9 999 04/10K
C18	100 µF	A9 999 09/B100
C19	2200 pF	A9 999 06/2K2
C20	3900 pF	A9 999 06/3K9
C21	22000 pF	A9 999 04/22K
C22	1800 pF	A9 999 06/1K8
C23	470 pF	A9 999 04/470E
C24	see C10	
C25	2.0 pF	A9 999 04/270E
C26	4700 pF	A9 999 04/4K7
C27	8200 pF	A9 999 06/8K2
C28	1800 pF	A9 999 06/1K8
C29	12000 pF	A9 999 06/12K
C30	100 µF	A9 999 09/B100
C31	100 µF	A9 999 09/B100
C32	8 µF)	
C33	8µF)	A9 999 11/P8 +8
C34	see C1	
C35	8 µF)	
C36	8 µF)	A9 999 11/P8 +8
C37	see C4	
C38	560 pF	A9 999 04/560E
C39	120 pF	A9 999 04/120E
C40	82 pF	A9 999 04/82E
C41	56 pF	A9 999 04/56E
C42	100 pF	A9 999 04/100E
C43	10000 pF	A9 999 06/10K
C44	10000 pF	A9 999 06/10K
C45	82 pF	A9 999 04/82E
C46	33 pF	A9 999 04/33E
C47	8 µF	A9 999 11/P8
C48	2200 pF	A9 999 04/2K2
R1	47 Ω	A9 999 00/47E
R2	47 Ω	A9 999 00/47E
R3	0.22 MΩ	A9 999 01/220K
R4	0.22 MΩ	A9 999 01/220K
R5	0.12 MΩ	A9 999 01/120K
R6	22000 Ω	A9 999 01/22K
R7	0.82 MΩ	A9 999 01/820K
R8	820 Ω	A9 999 01/820E
R9	0.22 MΩ	A9 999 01/220K
R10	27000 Ω	A9 999 01/47K
R11	0.22 MΩ	A9 999 01/220K
R12	0.47 MΩ	A9 999 01/470K
R13	1 MΩ	A9 999 01/1M
R14	1 MΩ	A9 999 01/1M
R15	0.56 MΩ	A9 999 01/560K
R16	68000 Ω	A9 999 01/68K
R17	1000 Ω	A9 999 01/1K
R18	0.33 MΩ	A9 999 01/330K
R19	4700 Ω	A9 999 01/4K7
R20	1000 Ω	A9 999 01/1K
R21	0.15 MΩ	A9 999 01/150K
R22	15000 Ω	A9 999 00/33K+
		A9 999 00/27K
R23	0.33 MΩ	A9 999 01/330K
R24	0.47 MΩ	A9 999 01/470K
R25	0.68 MΩ	A9 999 01/680K
R26	0.22 MΩ	A9 999 01/220K
R27	0.27 MΩ	A9 999 01/270K
R28	0.68 MΩ	A9 999 01/680K
R29	47000 Ω	A9 999 01/47K
R31	0.82 MΩ	A9 999 01/820K
R32	22000 Ω	A9 999 01/22K
R33	0.33 MΩ	A9 999 01/330K
R34	0.68 MΩ	A9 999 01/680K
R35	1 MΩ	A9 999 01/1M
R36	1000 Ω	A9 999 01/1K
R37	150 Ω	A9 999 00/150E
R38	1000 Ω	A9 999 01/1K
R39	1000 Ω	A9 999 01/1K
R40	150 Ω	A9 999 00/150E
R41	6800 Ω	A9 999 00/6K8
R42	150 Ω	A9 999 00/150E
R44	6800 Ω	A9 999 00/6K8
R45	150 Ω	A9 999 00/150E
R46	2200 Ω	A9 999 00/2K2
R47	2 MΩ	A9 999 16/GE2M
R48	0.15 MΩ)	
R48a	0.15 MΩ)	B1 639 54.0
R48b	0.2 MΩ)	
R49	0.5 MΩ	A9 99 1 /GL 50K + 450K
R51	0.12 MΩ	A9 999 01/120K
R57	470 Ω 2x	A9 999 00/1K
R58	56000 Ω	A9 999 01/56K
R59	0.15 MΩ	A9 999 01/150K
R60	6.8 MΩ	A9 999 01/6M8
R61	1.2 MΩ	A9 999 01/1M2
R62	33000 Ω	A9 999 01/33K
R63	47000 Ω	A9 999 01/47K

MISCELLANEOUS

SK1	ON-OFF switch	B8 710 00/D100	SK2	Output Switch	
	Spindle for selector switch	A3 197 93.0	SK3	Selector Switch	
	Socket for P.U. and Tuner	V3 606 83.0	SK4	Input Switch	
	Socket for speaker	A3 766 54.0	F1	Fuse 1/8 A 250 volt	646-029
	Socket for phono motor	A3 820 56.0	F2	Fuse 1/8 A 250 volt	
			X1	Rectifier, selenium H stack	SR275B130

NOTE:- pF = µµF

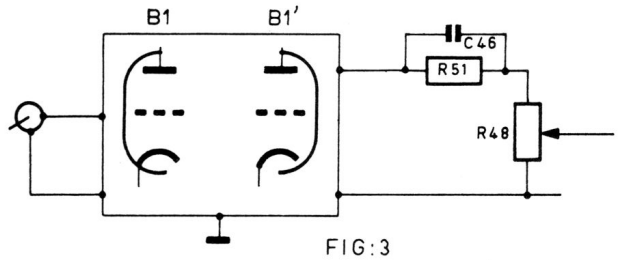


FIG:3

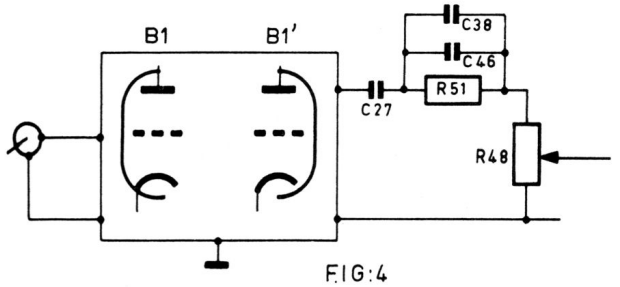


FIG:4

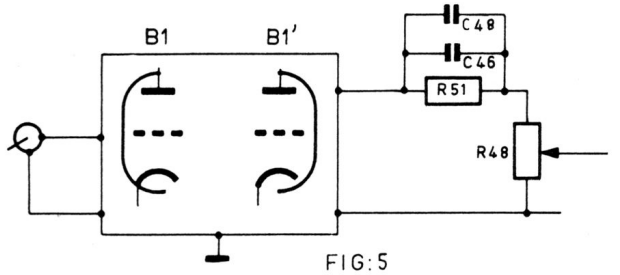


FIG:5

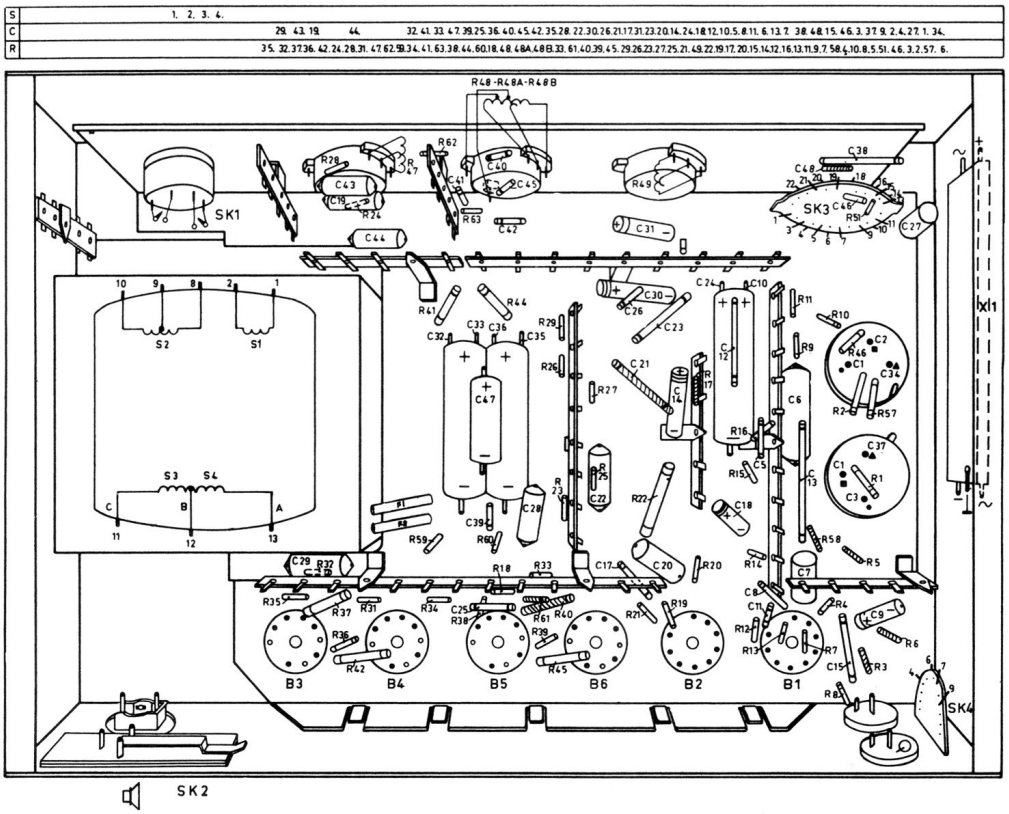


Fig.8

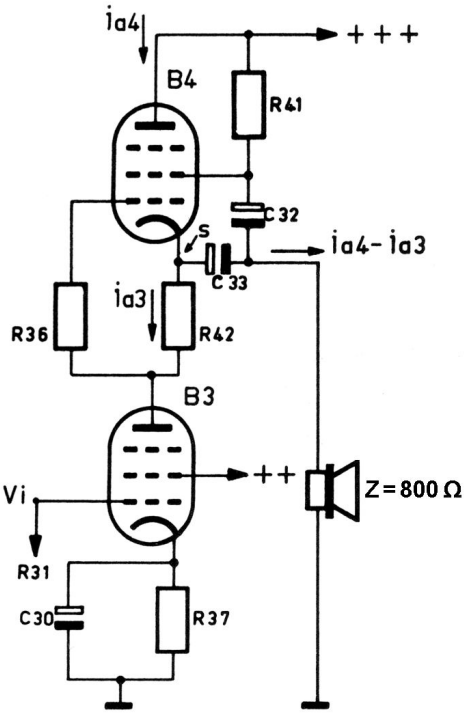


FIG:6