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McMICHAEL 382 MOTOR-TUNED NINE

Motor tuning, with automatic frequency control, is employed in the eight-valve, plus rectifier, three-band model 382 by McMichael.

CIRCUIT.—The input, on medium and long waves, is through a band-pass circuit and, on short waves, through a coupling coil to a single tuned circuit.

V1, the frequency changer, is a triode hexode. The oscillator circuit is on conventional lines with separate heterodyne voltage control resistors for each waveband. The hexode portion receives A.V.C. through the usual decoupling network and the anode circuit contains the primary of the first intermediate frequency transformer. There are alternative primary windings controlled by a switch so that the band acceptance can be increased in the high fidelity position.

V2, the I.F. amplifier, is a variable-mu pentode. This feeds the second I.F. transformer which, again, is a special type fitted with an auxiliary winding (this will be referred to later). The normal secondary goes to the signal diode of V3, a double diode triode.

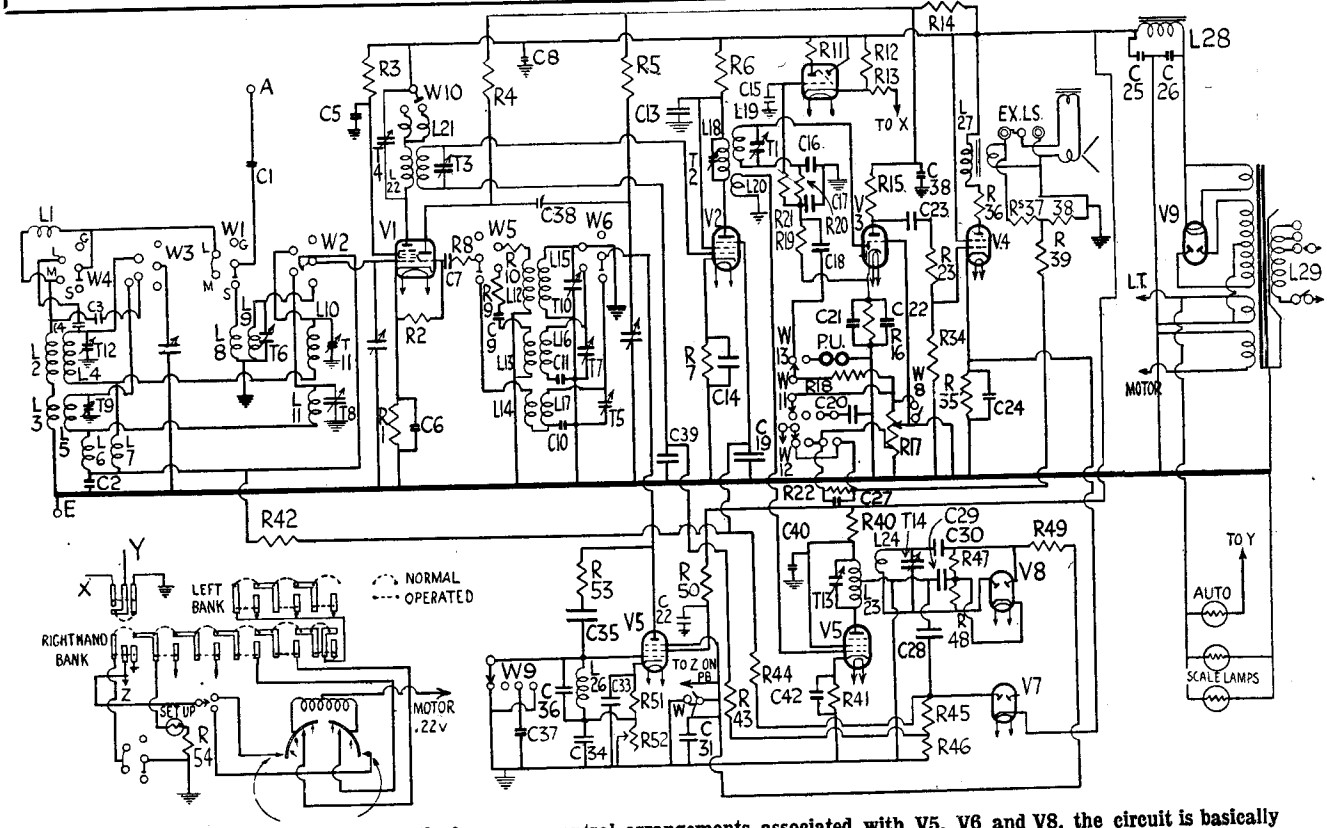
The rectified potentials across the diode load are taken through a coupling condenser to the volume control which works on the triode portion of the valve. The volume control has a special tapping for feedback purposes (see below).

Audio frequency amplification is carried out by the triode portion of V3, which is resistance coupled to V4, an output pentode. The secondary winding of the output transformer is connected to a resistance network and voltages produced across part of this are introduced through a filter to the tapping on the volume control of the triode valve in such a way that negative feedback is obtained.

The power supply is obtained through a mains transformer, full-wave rectifier,

CONDENSERS

C.	Purpose.	Mfds.	C.	Purpose.	Mfds.
1	Series aerial	.0002	20	Tone filter	.001
2	V1 A.V.C. decoupling	.1	21	V3 cathode by-pass	.01
3	M.W. top aerial coupling	.000007	22	V3 cathode bias shunt	50
4	L.W. aerial coupling	.000012	23	L.F. coupling	.01
5	V1 screen decoupling	.1	24	V4 cathode bias shunt	100
6	V1 cathode bias shunt	.1	25	H.T. smoothing	28
7	V1 osc. grid	.0001	26	H.T. smoothing	8
8	H.T. line shunt	.01	27	Feedback filter	.06
9	M.W. osc. grid	.0001	28	A.V.C. coupling	.00005
10	S.W. fixed padder	.0035	29	V8 cathode coupling	.00005
11	M.W. fixed padder	.000532	30	V8 diode coupling	.001
12	L.W. fixed padder	.000168	31	V5 suppressor decoupling	.1
13	V2 anode decoupling	.1	32	V5 screen decoupling	.1
14	V2 cathode bias shunt	.1	33	V5 cathode bias shunt	.1
15	T.I. fixed shunt	.1	34	V5 bias shunt	.1
16	H.F. filter	.0001	35	V5 grid phasing	.002
17	H.F. filter	.0001	36	V5 grid input tune	.000015
18	L.F. coupling	.005	37	V5 grid input M.W.	.00005
19	V2 suppressor grid decoupling	.1	38	H.T. sub-line decouple	8
			39	V2 A.V.C. decouple	.1



With the exception of the automatic frequency control arrangements associated with V5, V6 and V8, the circuit is basically orthodox. Motor-drive circuits (bottom left-hand corner) are separate from radio circuits.

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V9, and a smoothing choke in the form of a speaker field together with the usual electrolytic condensers.

Four further valves are also employed in this receiver. First of all there is V7, a double diode, one diode of which is employed for A.V.C., the cathode being returned to the cathode of the output valve and the A.V.C. voltages being taken through the usual decoupling networks.

The auxiliary winding of the second I.F. transformer is taken to the grid circuit of V6 which, in conjunction with V8, a double diode, forms an automatic frequency control discriminatory network.

The anode circuit of V6 contains a special transformer with the primary tuned to the intermediate frequency and a split secondary tuned as explained in the alignment notes. The diode and its associated network are connected to a control valve, V5, and at the precise intermediate frequency no rectified voltage is obtained.

If, however, the frequency varies, which may occur if the oscillator drifts or the automatic tuning introduces a mechanical tuning error, a rectified voltage will be produced across this network. The voltage may be either positive or negative with respect to the earth line. A full description of this principle appeared in the *Service Engineer*, November 5, 1938, page v.

V5 is the control valve. The positive or negative voltage produced across the network of V8 is applied to the suppressor grid of V5 through a simple decoupling network. The grid circuit of this valve contains an inductance-capacity combination and there is also a phasing network between the grid and the anode. Components are so adjusted that the network tends to act as an inductance and the whole arrangement is in parallel with the tuned oscillator circuit of the triode portion of V1.

Should the oscillator frequency drift, the V6-V8 combination produces a control voltage which alters the effective inductance of the V5 circuit, which, in turn, brings back the effective oscillator inductance so that the correct frequency is maintained.

Finally, there is a conventional tuning motor circuit, with the usual adjustable radial contacts and a lamp and resistance for setting the station selector contacts to the desired point.

(*Continued on page* 23)

RESISTANCES

R.	Purpose.	Ohms.	R.	Purpose.	Ohms.
1	V1 cathode bias	250	34	V4 grid bias	500,000
2	V1 osc. grid leak	50,000	35	V3 cathode bias	150
3	V1 screen decoupling	40,000	36	V4 anode stabilising	50
4	V1 osc. anode load	40,000	37	Speaker transformer pot. (part)	100
5	V5 anode load	17,000	38	Speaker transformer pot. (part)	300
6	V2 anode decoupling	2,000	39	Feed back input	5,500
7	V2 cathode bias	200	40	V6 anode decoupling	2,000
8	Regeneration modifier	100	41	V6 cathode bias	200
9	M.W. het. voltage control	1,000	42	V1 A.V.C. decoupling	100,000
10	L.W. het. voltage control	1,000	43	V2 A.V.C. decoupling	500,000
11	Tuning indicator feed	1 meg.	44	V2 suppressor grid decoupling	500,000
12	Tuning indicator cathode pot. (part)	60,000	45	A.V.C. diode load (part)	1 meg.
13	Tuning indicator cathode pot. (part)	500	46	A.V.C. diode load (part)	120,000
14	H.T. line decoupling	5,000	47	1st discriminator diode load	1 meg.
15	V3 anode load	30,000	48	2nd discriminator diode load	1 meg.
16	V3 cathode bias	1,000	49	Control bias decoupling	1 meg.
17	Volume control	500,000	50	V5 screen decoupling	8,000
18	H.F. stopper	500,000	51	V5 cathode bias fixed	300
19	V3 demodulating diode load	200,000	52	V5 cathode bias variable	500
20	H.F. filter	50,000	53	V5 phasing resistance	100,000
21	T.I. grid decoupling	1 meg.	54	Setting lamp resistance	200
22	Feedback filter	200,000			
23	V4 grid filter	500,000			

McMichael 382 on Test

MODEL 382.—For A.C. mains, 200-250 volts, 50-100 cycles. Price, 18½ gns.

DESCRIPTION. — Eight-valve, plus rectifier, manual and motor tuned three-waveband superhet.

FEATURES.—Full-vision scale calibrated in names and wavelengths, with inset tuning indicator. Wave-range and fidelity indicators operated by controls. Twelve push-buttons, controls for tuning, master switching, volume, range and fidelity, as well as motor assisted manual tuning, sockets for aerial and earth and pick-up.

LOADING.—80 watts.

Sensitivity and Selectivity

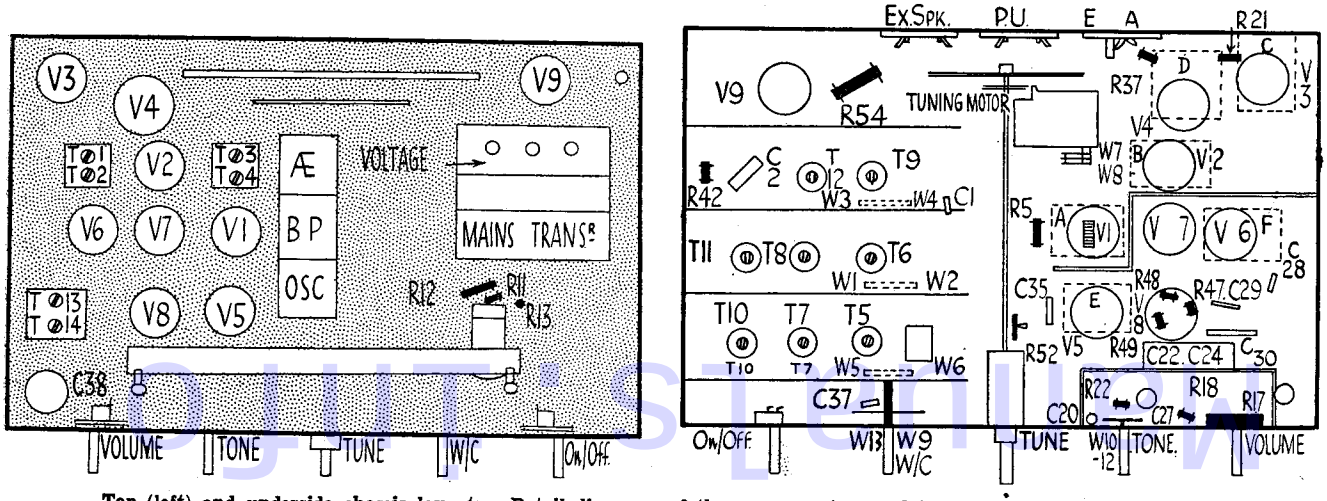
SHORT WAVES (18.6-50 metres).—Excellent short wave gain and adequate selectivity, with easy handling and no drift and a well-maintained gain.

MEDIUM WAVES (200-550 metres).—Excellent gain and selectivity, with local station spread on adjacent channels only and a clean background.

LONG WAVES (850-2,000 metres).—Adequate gain and selectivity. All main stations easily received and very little interference on Deutschlandsender.

Acoustic Output

The pentode fitted gives ample volume for quite a large room without any distortion. In the high fidelity position the quality is very pleasing, with good, clean, crisp attack and good high frequency radiation. The bass is not over pronounced, the general balance on orchestral music being well proportioned. There is very little colouration on speech.



Top (left) and underside chassis layouts. Detail diagrams of the component assemblies attached to the valve-holders (lettered A to F above) are given, under corresponding letters, on page 23.

Radio Service Data

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McMichael Motor-tuned Model 382

(*Continued from page* 13)

Special Notes.—The whole arrangement of this receiver is somewhat unorthodox, and the arrangement of the components is such that they cannot be shown clearly by our usual methods. Most of the valve-holders have a network assembly consisting of a bakelite plate with a large number of tags bolted to the holder by two studs. These assemblies carry various decoupling and other networks associated with each particular valve. (A construction of this type is frequently used in ultra short-wave technique.)

Owing to the compact assembly, the under-chassis layout diagram will be seen to contain a number of lettered rectangles corresponding to each assembly, and there is a separate expanded drawing of each one.

If it is necessary to service any of these assemblies the simplest plan is to remove the assembly completely by undoing the two nuts which retain the studs at the side of the valveholder and removing or slackening any of the associated leads.

Switch Details

We have also departed from our normal switch diagrams. In this set the tuning unit is built as a separate assembly with the switches. Nothing is visible from the bottom of the chassis. To service this section, the whole unit can be withdrawn by releasing retaining bolts and also disconnecting certain of the leads. In doing this a careful note should be made of the actual positions of the associated leads by making a sketch.

The unit can then be withdrawn and the leads between the coils and the switches, which are closely adjacent, are so short that not the slightest difficulty will be experienced in identifying any of the points as shown by the circuit, since there is nothing complicated in the switching arrangements.

There are two main switch controls, the wave-change assembly and the fidelity assembly. The wave-change assembly carries the three banks which are located in the tuning pack.

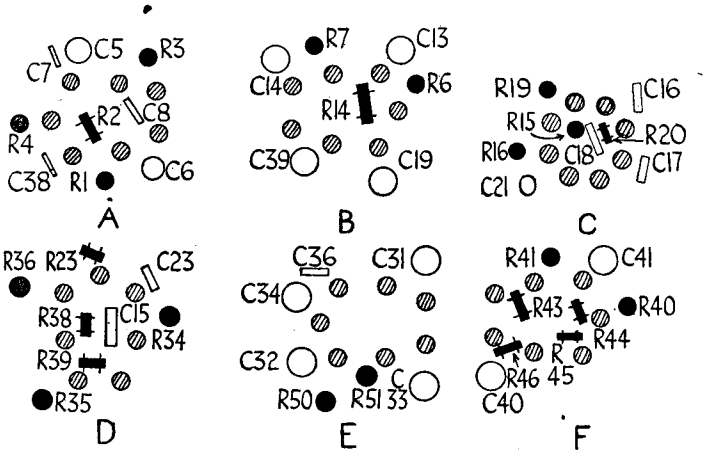
On the same shaft there is another switch assembly adjacent to the "click" plate. This carries the switching for the control valve and the pick-up, that is, W9 and W13. The remaining switch wipe shown on the diagram will be found on the special fidelity switch.

The contacts W7 and W8 for muting purposes are located at the back of the tuning motor and are operated by the axial displacement of the shaft.

In the model examined, a small H.F. choke was found located on the top of the assembly marked "A" in the drawing. This is in the heater circuit of the mixing valve for technical reasons which are now becoming generally recognised.

Practically all the resistances and condensers will be easily located with the exception of R53 and C9, C10, C11 and C12, which are inside screening compartments.

Owing to the particular coil assemblies which are used and the inaccessibility of points for measuring the inductances, the usual windings table is modified. The windings of the coils can be checked on the actual coils themselves, which are immediately available for inspection when the unit is withdrawn and dismantled.



This drawing shows the components near the valveholders. The positions of the assemblies are shown by the letters, A to F, on the under-chassis diagram, page 13.

VALVE READINGS

V.	Type.	Electrode.	Volts.	Ma.
1	ACTH1 ..	Anode ..	225	1.5
		Screen ..	65	4.0
		Osc. anode	43	3.8
2	ACVP2 ..	Anode ..	202	9.0
		Screen ..	202	2.3
3	HL41DD ..	Anode ..	135	2.0
4	AC5 Pen ..	Anode ..	225	37
		Screen ..	225	5.8
5	AC5P1 ..	Anode ..	161	2.0
		Screen ..	185	5.0
6	ACVP2 ..	Anode ..	185	9.0
		Screen ..	185	2.3
7	V914	—	—	—
8	V914	—	—	—
9	UU4 .. .. (*All Mazda.*)	Heater ..	285	—

WINDINGS (D.C. *Resistances*)

L.	Ohms.	Where measured.
18	13	V2 anode and C13+R6.
19	16	V3 signal diode and C16+R20.
20	.9	V6 grid and chassis.
21	2	V2 grid and C39+R43.
22	6	V1 anode and C8+R3.
27	290	Yellow and red on speaker strip.
28	700	On tags.
29	12	Mains plug.

Chassis Removal.—Withdraw the six control knobs on the front by releasing the grub screws, release the four chassis-retaining bolts and unscrew the two small wood screws which retain the top of the push-button escutcheon plates inside the front of the cabinet. The chassis can then be withdrawn after releasing the multiple speaker cable from the small clips.

If it is desired to disconnect the multiple cable from the speaker, the order of tags reading from top to bottom, with the speaker transformer on the left in the normal position, is as follows: Black, chassis; brown, No. 1; yellow, 2; red, 3; blue, 4; white, 5; and green, 6.

The electrolytic smoothing condensers are screwed to the speaker baffle. The brown and black leads in the condenser block are connected to the speaker chassis, the red lead to tag No. 1, and tag 3 is joined to a common junction point of the yellow and blue leads, which are soldered on to the tags screwed to the baffle board.

Replacement Condensers.

Exact replacement condensers available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18, are: For the block on the baffle, unit 1175, 11s. 6d.; C38, unit 4286, 4s. 6d.; and for the C24 × C22 block, unit 1176, 4s. 6d.

Alignment Notes

I.F. Circuits.—Switch the receiver to M.W. with the gang condenser at minimum and the tone switch at normal. Connect an output meter to the extension speaker sockets and the signal generator to the grid of V1.

Inject a frequency of 465 kc. and adjust T1, T2, T3 and T4 in that order for maximum output. Use a low input below the A.V.C. level.

Discriminator Circuits.—Inject a strong 465-kc. signal to the grid of V1 and adjust T13 to such a position that a minimum *dip* is obtained on the output meter. It is essential to turn down the volume control to prevent overloading.

Next adjust T14 so that a maximum *peak* is obtained on the output meter.

Medium Waves.—Connect the signal generator to the aerial and earth sockets of the set, and switch to M.W. First check the position of the pointer. With the gang at maximum the pointer should lie over the vertical stroke of the letter "**E**" in the word "Medium."

Inject 1,400 kc. (214 metres) and adjust T7 for maximum with the set accurately tuned to the scale setting for 214 metres.

Then adjust T8 and T9 for maximum output.

There are no padding adjustments on this receiver.

Long Waves.—Switch to L.W. and, having checked the pointer position, tune set and oscillators to 300 kc. (1,000 metres).

Adjust T10 for resonance and then T11 and T12.

Short Waves.—Switch to S.W., and having checked the pointer, tune set and oscillator to 18 metres and adjust T5 for resonance and then T6 and T7.

Press-button Adjustment

Tune in the desired station accurately by means of the tuning indicator. The button chosen for the station must be one with its contact near the "switch" line on the motor contact plate. Release the locking screw of the contact. Hold in the station push button and the manual button simultaneously. The "set-up" lamp will then light. Slide the contact along the bar until it reaches the switch line. The "set-up" lamp extinguishes as soon as the contact lies on the insulating switch line.

Tighten the locking screw on the contact and then test the operation.

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