

CONSOLE TYPE SPEECH-INPUT EQUIPMENT

By JOHN P. TAYLOR

COMPLETE speech-input assemblies built into small console-type cabinets are a development of the last two years; and, in fact, have come into widespread use only in recent months. All previous speech-input design was based on the accepted convention of rack-mounted panel-type units. Such an arrangement, having the obvious advantages of flexibility and standardization, was—and probably still is—the best system for larger stations and network studios. On the other hand it was—and, to a lesser degree, still is—an expensive consideration for smaller stations.

The question of why less expensive equipments did not make their appearance sooner is probably answered by the economics of the situation. Until recent years sales of equipment to larger stations made up such a large percentage of the business (dollar volume) that designs were inevitably pitched to their standards. However, with a steadily increasing number of smaller stations and, even more important, higher incomes for most of these, this field has of late become one which the manufacturers could not afford to overlook. As a result, equipments particularly fitted for small stations have been appearing in increasing number. The several special low-power transmitter designs recently described¹ are a case in point. Console-type speech equipments are another.

In practice, console equipments have other advantages, in addition to the price differential. Since placement of mixers and controls in some type of console is now almost universal practice, the use of rack-mounted amplifiers necessitates inter-unit wiring. Thus console equipments represent a saving in installation cost—also, since they are “factory assembled and tested,” there is usually a saving in installation time. Moreover, racks are

clumsy, and require floor space; consoles are of convenient size, mount on almost any kind of a table or desk, and do not add to the required floor space.

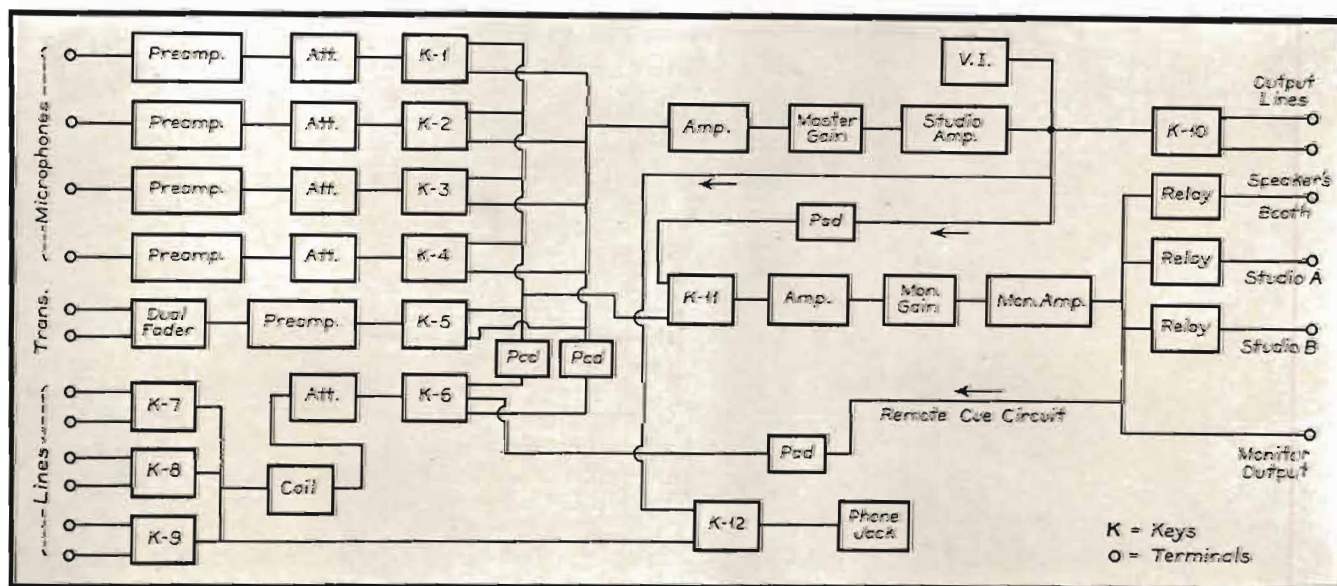
Use of console equipment is not necessarily a prerogative of small stations. In larger studio installations, where separate control booths for each studio are the practice, they should find a convenient application. The equipments ordinarily specified for such booths make up what is commonly known as a single-channel assembly. These new console assemblies consist, basically, of the same units—and should, therefore, be ideal for this use. They lack, of course, the ease of servicing of the deluxe speech-input panels, and they do not conform to the “build up” idea. However, the other advantages may often outweigh these latter.

Despite these possibilities in larger stations, the main application of these equipments is bound to be in smaller stations. Apparently with this in mind, the manufacturers have obviously devoted considerable attention to the development of switching and control systems which would increase the flexibility of these equipments to the point where they would suffice to meet all the speech-input requirements of small stations. Thus, by various ingenious arrangements, they have extended the ordinary functions, of what are actually single-channel layouts, in such degrees that they handle microphones in two studios, transcriptions and remote lines with convenience—and, in some instances even provide talkback, auditioning and remote cueing. The best idea of the possibilities, as well as the limitations, of these stratagems is obtained by briefly reviewing the features of the standard models announced to date.

TYPE 12H

The Type 12H speech-input assembly furnishes a striking illustration of the extent of the facilities that can

Fig. 2. Block diagram of the Type 12H speech-input assembly.



¹"The Low-Power Transmitters," by J. P. Taylor, *Communication and Broadcast Engineering*, June-July, 1937.

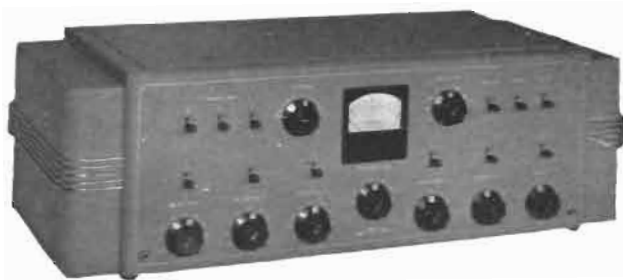


FIG. 1. Front view of the 12H speech-input assembly for studio applications.

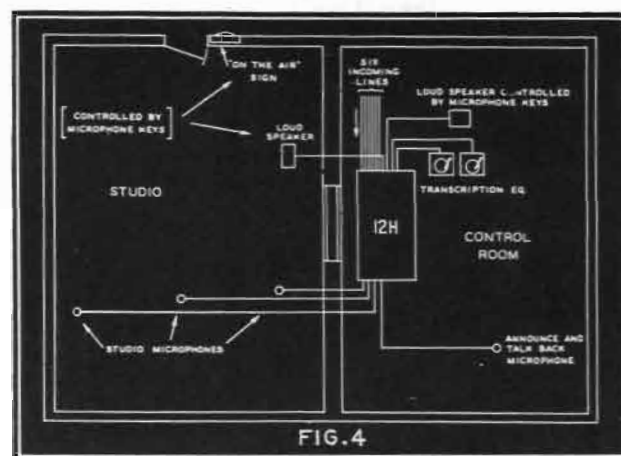
be built into a small-sized equipment. There are four microphone inputs, two transcription inputs and six line inputs; five pre-amplifiers—four in the microphone inputs and one following the dual faders, in which the transcription inputs are combined; no less than six mixers—one being especially reserved for handling remotes; and a switching system providing auditioning, talkback, remote cueing and other conveniences. These, of course, are in addition to the usual master gain, main amplifier, volume indicator, monitoring system and accessories—also a complete interlocking control system.

Referring to the front view of the Type 12H equipment (Fig. 1) the six mixers will be seen ranged along the bottom of the control panel. The main gain is slightly higher, in the center of the panel. At the left and right of the V. I. meter are the V. I. range switch and the monitoring gain control. Above each of the six mixers is a two-position key switch. These are the "audition"- "program" switches. As they are an unusual feature they deserve a further explanation. Referring to the block diagram of the 12H (Fig. 2) these six switches—K-1 to K-6—will be seen to be associated with the six mixer positions. When one of these switches is set at "program," the mixer which it controls is connected to the program circuit. If it is set at "audition," the monitor key (K-11) is also set at "audition." The mixer and associated input circuit is connected direct to the monitoring system (which is disconnected from the program circuit by the operation of K-11). This is the setup for auditioning simultaneously with program. Any of the six input circuits can be used alone, or in combination, for auditioning, while any of the remaining ones are used on program. There are, of course, limits to this arrangement. For one thing, program monitoring must be done by V. I. alone—or with headphones. Also the practical difficulty of mixing two

programs at once may arise. However, remembering that most small stations use transcriptions much of the time, and that most regional stations depend largely on "chain," it seems likely that this arrangement will ordinarily suffice.

The remainder of the circuits of this equipment will be fairly clear from the diagram. Switches K-7, K-8 and K-9 allow choice for any six remote lines, for which terminals are provided; switch K-10 for choice of two output lines. Switch K-12 allows use of phones for program monitoring, or monitoring of incoming remotes. An interesting feature, in this connection, is that when switch K-6 is in the center position, cue may be fed to a remote point. Relays are provided, as shown, for interlocking speakers as desired.

The mechanical design and appearance of the Type 12H assembly will be fairly evident from the several views shown. The finish of both the housing and panel is crystalline gray. Overall dimensions are 35" long by 11" high by 15½" deep. In addition there is a small external unit which contains the power supply. Connections between this and the main unit, as well as the microphone connections, are of the plug-in type. All are ordinarily hidden from view by the end sections of the cabinet, which are easily removable. Looking inside



Arrangement utilizing a console-type equipment in a single-studio installation.

FIG. 8. The Type 23A speech-input console set up in a control booth of the Mutual Broadcasting System.



the unit, the amplifier components are found to be arranged on four cushion-mounted chassis. From left to right (Fig. 3), these consist of: First, the four microphone preamplifiers; second, the main amplifier; third, the monitoring amplifier; and, fourth, the relays and filter components. The fifth preamplifier—the one in the transcription input—is a small unit mounted on the rear of the panel at the extreme right.

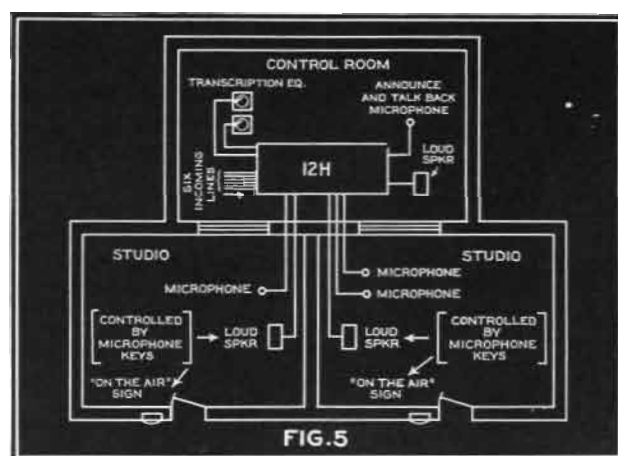
The efficient application of a console equipment, such as the Type 12H, to simple studio requirements is illustrated in Fig. 4 and Fig. 5—which are, respectively, typical arrangements for single-studio and two-studio installations. The console is placed on a table or desk just in front of the studio observation window—so that the operator looks over it into the studio or studios. One microphone and one loudspeaker are placed in the control room or booth. One of the relays is connected so that operation of the key which connects this booth microphone cuts out the booth speaker—thereby automatically forestalling danger of feedback. The remaining microphones are placed in the studio—or divided between the two studios. Loudspeakers are also placed in the studios and the remaining two relays so connected as to cut these off when microphones in the same location are "live." "On-the-air" signs at the studio

doors can be operated by the same relays. The transcription equipments are located in the booth so that transcription programs can be handled by a single operator-announcer. These facilities, together with the switching facilities provided for the incoming remotes, are all that are required in small stations.

TYPE 12L EQUIPMENT

The Type 12L console assembly is a new equipment of quite different characteristics. While any of the console equipments described here might be used at the transmitter, the Type 12L is the only one especially designed for this particular use. It provides inputs for lines from the studio, for a local announce microphone, for transcription equipments and for a connection from the r-f monitoring circuit of the transmitter. In addition, it contains an equalizer circuit, a standard volume indicator, and switching circuits adapted to this type of use. There are also controls which may be used as extensions of the transmitter control circuits, and a lamp which may be connected with the peak indicator on the modulation monitor.

Generally speaking the Type 12L equipment is an adaptation of the 12H, which has been described above. The construction and mechanical design are identical.



Arrangement utilizing a console-type equipment in a two-studio single-control-room installation.

The appearance (see Fig. 6) differs only in the arrangement of controls. Since fewer mixers are needed, the monitor gain control and the equalizer loss control replace two of the mixers along the bottom of the panel. Thus there is provided a space at the upper right of the panel in which have been placed the peak flash lamp and on-off switches for transmitter control. Looking inside the console, the only change is the removal of two of the microphone preamplifiers, and the small transcription preamplifier, which were used in the 12H equipment.

The arrangement of components, and of the switching circuits, of the 12L are markedly different. The block diagram (Fig. 7) illustrates the general layout. Since the relay circuits in this instance have a definite application, their action has been indicated by dotted lines which connect each relay with the associated key. Referring to this diagram, it will be seen that there are four input-mixer circuits which may be fed into the line amplifier. The first of these four circuits accommodates the two lines from the studio. A two-position key switch, K-1, in the circuit is so connected that when the input from line 1 is utilized a telephone is connected to line 2, for use in talking to the studio. When the key is in position 2 the program is received over

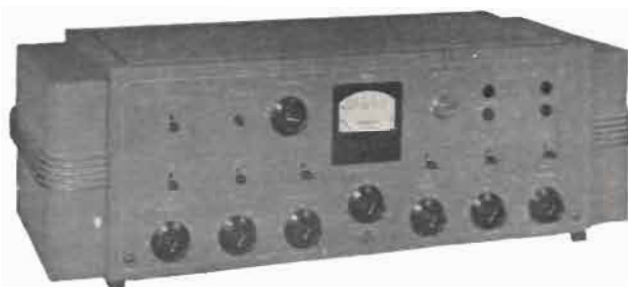


FIG. 6. Front view of the type 12L speech-input assembly for transmitter control.

line 2; the telephone is then out of circuit but operation of line 1 can be checked with headphones through switch K-6. The second input circuit provides for handling a local source of pickup; this will only be used in special cases. The third input circuit accommodates a local announce microphone. This circuit includes a preamplifier so that a high-quality microphone may be used. The fourth input circuit provides for local origination of transcription programs, emergency or test record programs, etc. By means of the associated mixers any of the four inputs may be used to feed the transmitter.

The monitoring system is so arranged that operation of switches K-5 and K-7 will allow monitoring across the output of the mixer circuit, the output of the line amplifier, or from the r-f rectifier in the transmitter. The last is the normal connection—since it provides continuous aural check on the operation of the whole installation. A relay in the output of the monitoring amplifier cuts off the monitoring speaker automatically for local announcements. There is another relay which may be similarly used in connection with the local input circuit. Finally, there is an arrangement such that in case of failure of the line amplifier, the monitoring amplifier may be instantly substituted. This is made possible by switch K-7, which in the one position connects the monitoring system to the output of the mixers and simultaneously operates a relay which places the transmitter line across the output of the monitoring amplifier.

TYPE 23A EQUIPMENT

The Type 23A speech-input assembly is another equipment which has become very popular and is in widespread use. Intended primarily for high-quality studio use, the emphasis in this equipment is placed on attaining high-fidelity in a relatively simplified setup. The facilities provided are approximately the same as

FIG. 3. Interior of the Type 12H speech-input assembly.

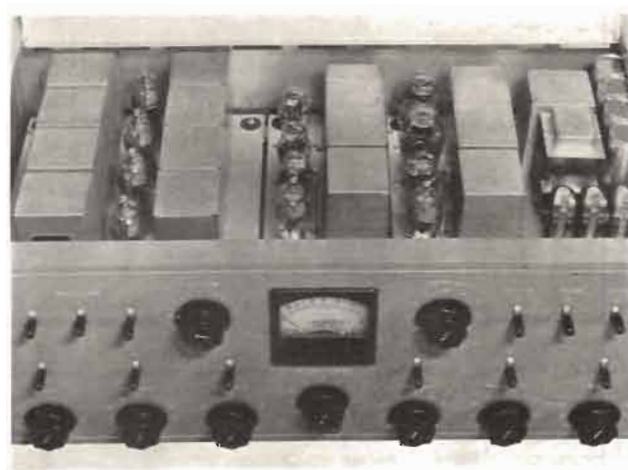




FIG. 11. Front view of the 76-A speech-input console.

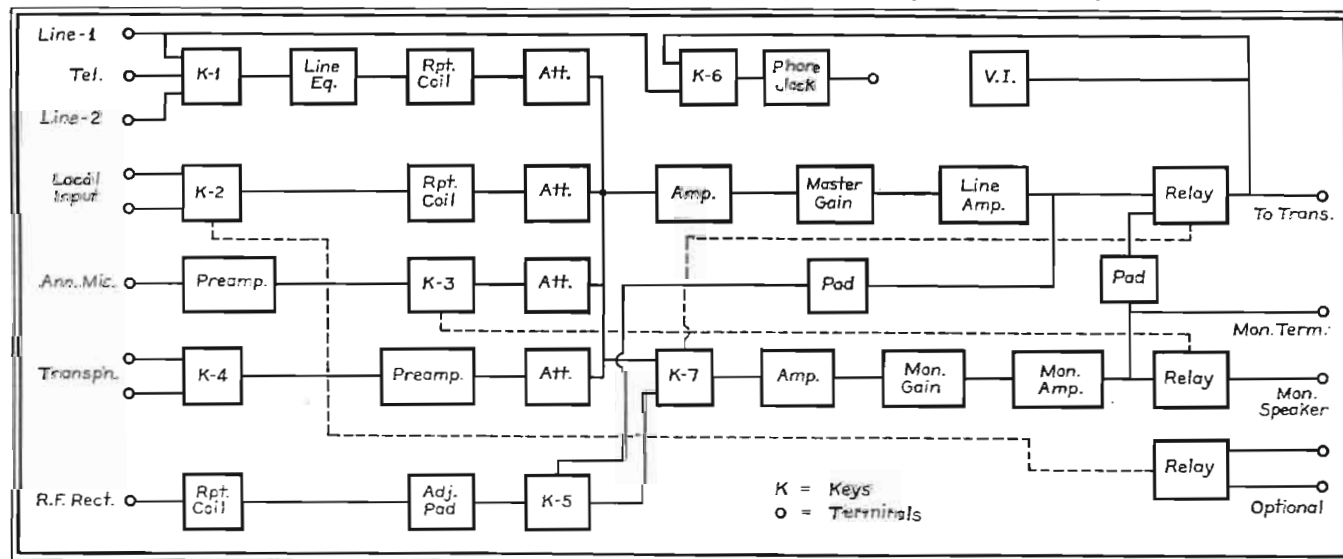
in the first equipment described above, although the switching facilities are quite differently arranged. Inputs are provided for eight microphones or transcription equipments, for an announce or talk-back microphone, for four line inputs, and for an external cue or monitoring input (as, for instance, from the transmitter). There are switching facilities providing for talkback to either of two studios, and for a particularly convenient method of handling incoming remotes. In addition, of course, there are the usual master gain, main amplifier, volume indicator and monitoring units. Also an interlocking control system, a means for checking plate currents, and provision for a signaling circuit.

The dimensions of the Type 23A equipment, 34" wide by 10" high by 14" deep, are practically the same as those of the equipments previously described—these apparently being the most convenient with respect to the particular placement required of an equipment of this type. The appearance of this unit is, however, quite different. The upper part of the metal housing is divided into three sections, with the main control panel located on the center section and sloped for convenient observation of the volume indicator. Also located on this panel are the monitoring gain control, the master gain control, the output and input keys, and the talk-back and cue keys. The other operating controls are located on a vertical panel extended across the width of the equipment. At the left, the four program line keys; in the center, the five mixers; and, at the right, the signaling, plate current, and power switches, also the test and monitoring jacks.

The arrangement of circuits and the operation of the Type 23A equipment are illustrated in the block diagram (Fig. 9). As will be seen, there are four preamplifier input circuits. Each preamplifier is preceded by a two-

position switch (K-1 to K-4), so that eight microphone and transcription inputs are provided. This arrangement is not intended for switching of microphones which are in use, but merely for setup purposes. Thus, as ordinarily connected, switches K-1, K-2, and K-3 in the up position connect to microphones in Studio A, and in the down position to microphones in Studio B, while switch K-4 is reserved for transcription inputs. There is an additional switch K-5 which brings into the circuit a microphone located in the control booth. This may be used for announce purposes (on transcription programs) or for talkback to either studio. A fifth mixer is reserved for handling incoming remotes. The method provided for handling these is a unique feature of this equipment, and is unusually convenient. Each of the incoming line inputs is brought into a three position switch. In the up position these switches connect the input into the mixer—as for program transmission. In the down position they connect the input to a terminal which can be arranged to feed directly into the monitoring system. In the center position they are, of course, dead. This arrangement allows the program—as for instance a network program—which is coming in to be monitored over the regular monitoring system up until the moment at which the remote program is to go on the air, at which time operation of a single switch transfers it to the program circuit. The selection of the circuit to be monitored is made by means of switch K-11 which places the monitor system either on the incoming line circuit (as previously mentioned), across the output of the main amplifier, or across an input which may be variously used for external cue or for a line from the transmitter monitor or the like. The monitoring system follows the standard arrangement, consisting of a separate monitoring gain control, a monitoring amplifier and output connections through relays for three monitoring loudspeakers. The relays may be connected to the microphone input keys as desired in order to obtain automatic speaker cut-off in each of the studios as well as the booth. The program circuit is also conventional, consisting of a low-level amplifier followed by the master gain control and the main amplifier, with a volume indicator (illuminated meter) bridged across the output. A minor difference is that the monitoring system is fed at a relatively high level. Thus the pad usually placed in the program monitoring line is, in this instance, placed in the line to the transmitter. It is fol-

FIG. 7. Block diagram of the 12L. Dotted lines indicate operation of relays.



owed by the usual two-position switch for choice of output lines.

TYPE 23B EQUIPMENT

The Type 23B speech-input assembly is identical to the Type 23A assembly in all respects except the placing of the main gain control. Referring to the description of the Type 23A, it will be noted that the five mixers are lined up on the lower center panel—while the main gain control is at the upper right of the sloping panel. This arrangement is of maximum convenience where the respective mixers are used not only for mixing but also for riding gain—that is, where the main gain is used only for occasional rough adjustments. The Type 23B equipment, on the other hand, places the main gain control at the right of, and on a line with, the four microphone mixers—that is, in the place occupied by the line mixer on the 23A. The line mixer is placed at the upper right of the sloping panel. This arrangement is more suited to the requirements of stations where operators ride gain principally by the use of the main gain control, and use the mixer controls only for adjustment of relative levels, and for cutting in or out the microphones and other program sources. This seemingly small difference is one which becomes of considerable importance in operation—since an awkward arrangement will greatly increase operator fatigue.

TYPE 76-A EQUIPMENT

The Type 76-A console—so called by the manufacturer—is a console-type speech-input equipment generally similar in function and operation to the studio-type equipments described above. The facilities included are approximately the same, although here again the switching arrangement provided shows a rather marked difference. There are input connections for six studio microphones, for a talkback microphone, for eight line transcription inputs, and for an external cue or monitoring input; three preamplifiers; a three-position mixer, plus a fourth independent input mixer circuit; and an unusual switching arrangement providing for auditioning, talkback, and convenient handling of remotes. Also, of course, a master gain, main amplifier, volume indicator, monitoring system and relays for automatic cut-off of monitoring speakers. The block diagram (Fig. 10) indicates the arrangement of components and circuits in the Type 76-A equipment. Immediately noted will

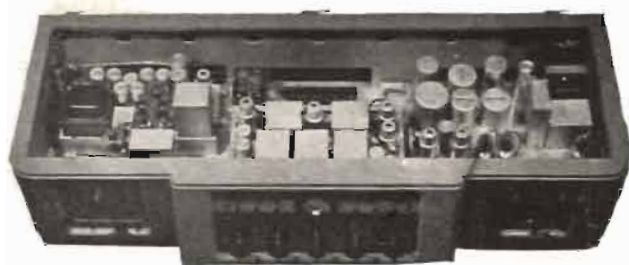


FIG. 12. Interior of the 76-A. Note use of standard rack-type chassis units.

be the fact that these more closely approximate, than do any of the other equipments, the usual arrangement of units in rack-mounted equipment. As a matter of fact, the three main units of this equipment, that is, pre-amplifier-mixing system, main amplifier-V. I. system, and monitoring amplifier, are simply rack-type units mounted in a console of convenient dimensions. By means of an ingenious switching system these units perform not only the usual functions of a single-channel studio equipment, but also provide for an additional studio, for talkback, for handling of remotes, and for limited auditioning. The method of accomplishing this should be evident from a study of Fig. 10. The three pre-amplifier input circuits are extended to handle microphones in two different studios by the same stratagem as employed in the previously described equipment—that is, by the placing of two-position key switches in each input, so connected that in the No. 1 position they connect to microphones in one studio and in the No. 2 position to those in the other studio. Still greater flexibility is gained by carrying this process a step further and placing three two-position switches following the pre-amplifiers—that is, in the inputs to the three associated mixers. These provide for bringing in 250-ohm lines either from remotes or from transcription equipments. Two-position switches (K-7 to K-9) in these three lines provide for switching of six input pairs. In addition to these inputs, there are two other pairs which, through K-10 feed into a fourth independent mixer control. Through operation of switch K-11 in this circuit, or switch K-12 in the program circuit, either of the two may be connected to either the monitoring circuit or the program circuit. This provides a means of carrying on

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FIG. 9. Block diagram of the 23A.

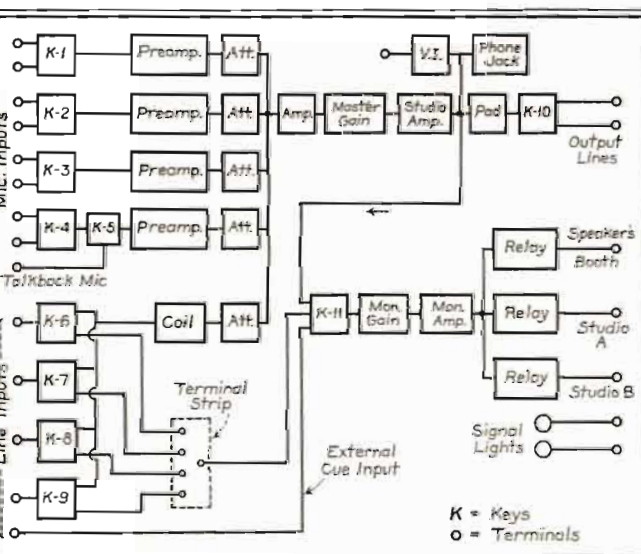
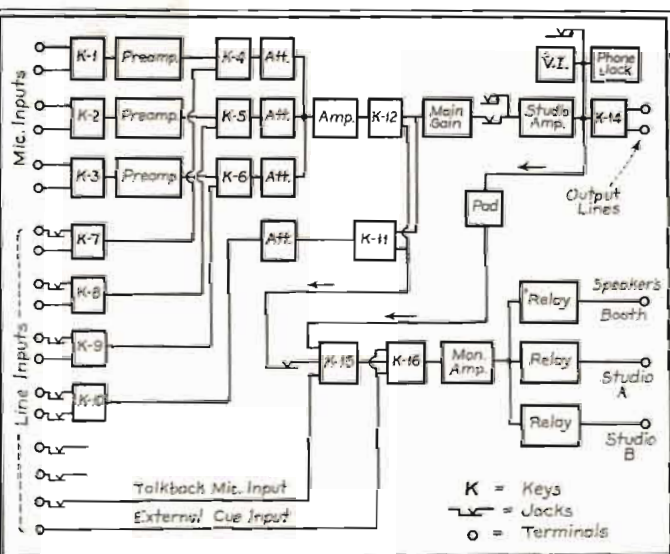


FIG. 10. Block diagram of the 76-A.



CONSOLE TYPE SPEECH-INPUT EQUIPMENT

(Continued from page 17)

auditions simultaneously with programs, provided that the programs are from transcriptions or from remote points—in other words that they may be brought in through K-10 and K-11 to the program circuit, while the audition program goes through K-12 and K-15 to the monitoring circuit. Switch K-15 is a three-position switch which allows the monitoring system to be placed across the output of K-11 or K-12 (as above), across the main amplifier output, or to be fed from the talkback microphone input. Switch K-16 allows an external cue or a connection from the transmitter monitor to be fed to the monitoring system or the studio.

The appearance and construction of the Type 76-A equipment are shown in Figs. 11 and 12, the front and interior views. The main operating controls are placed on a sloped center panel along with the volume indicator. Two small panels, at the left and right contain the auxiliary controls. Looking inside of the cabinet, the three main units are easily distinguished. These are the preamplifier-mixer in the center, the main amplifier at right, and the monitoring amplifier at the left. These three chassis units are almost the same as the rack-mounted units of this same line. The use of these without change is made possible by the somewhat greater

dimensions of this equipment—52" wide, 12" high, and 20" deep. Whatever disadvantage the slightly larger size may incur is probably offset by the use of standard units, easily serviced and, in general, interchangeable with rack-type units of similar function. Another advantage of this arrangement is that the system provides gain to spare—which, in turn, makes possible the flexibility achieved. The controls of this equipment naturally resemble closely those of a standard rack equipment, with, of course, the exception of the added number of switches. All of the mixers and gain controls are of the large finger-grip type and are provided with plainly marked scales. Other details of this equipment are similar to provisions of standard rack-mounted units. For instance, a miniature jack panel—with twelve jacks—is mounted at the left of the equipment. In addition to greatly increasing the flexibility of the equipment, these jacks are of convenience in case of failure—since the operation of the system may be checked at a number of points. Also valuable in this latter respect is the provision of a switching system which allows the V. I. meter (of the illuminated type) to be used for checking individual plate currents—a considerable convenience and time saver in locating defective tubes.

NOTES AND COMMENT

(Continued from page 33)

ated to the proper level to suit the equipment under test. A power-level indicator, incorporated in this panel, may be used to measure the input to the attenuator system or the output of the amplifier being tested. Output levels obtainable from this panel range from +10 db to -83 db while the power-level indicator range is from +10 to -8 db. The output impedance may be adjusted to 500, 250, or 50 ohms to suit the equipment to be tested. All

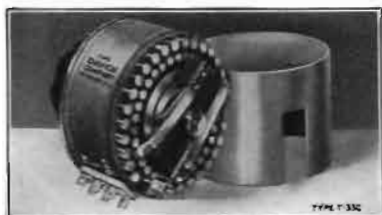
connections to the attenuator panel are brought out to standard jacks for maximum ease of operation.

With these three units, the Type 69A distortion and noise meter, the Type 68A low-distortion oscillator, and the Type 89-A attenuator panel, complete information on any broadcast transmitter or audio-frequency equipment as to frequency characteristic, gain, noise level, and distortion at any output level and at any frequency, can be obtained

rapidly and conveniently and adjustments to improve its operation made with ease and precision. The importance of proper adjustment of broadcast equipment cannot be over-emphasized since lower distortion and lower noise levels result in wider volume range and higher average modulation, the equivalent of increased transmitter power.

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