

Sept. 4, 1934.

F. MERK

1,972,199

TELEPHONE INSTALLATION

Filed Feb. 14, 1933

3 Sheets-Sheet 1

Fig. 1

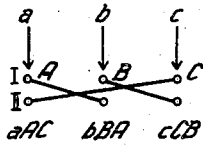


Fig. 1a

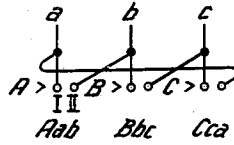


Fig. 2

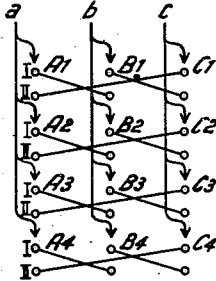


Fig. 2a

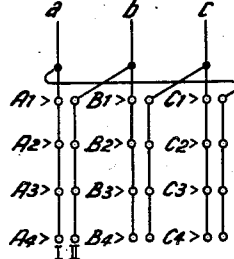


Fig. 3

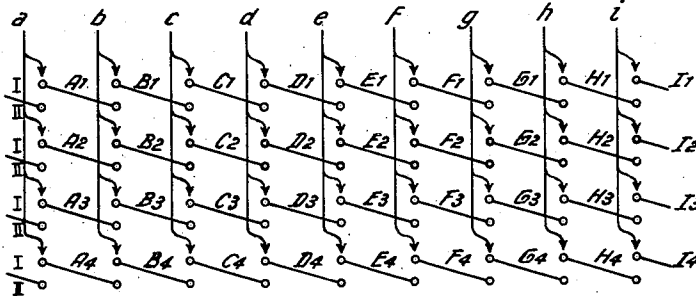
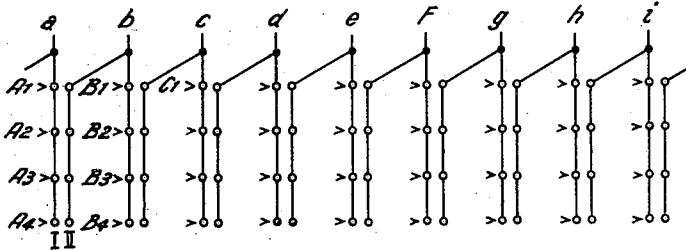


Fig. 3a



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Fig. 4

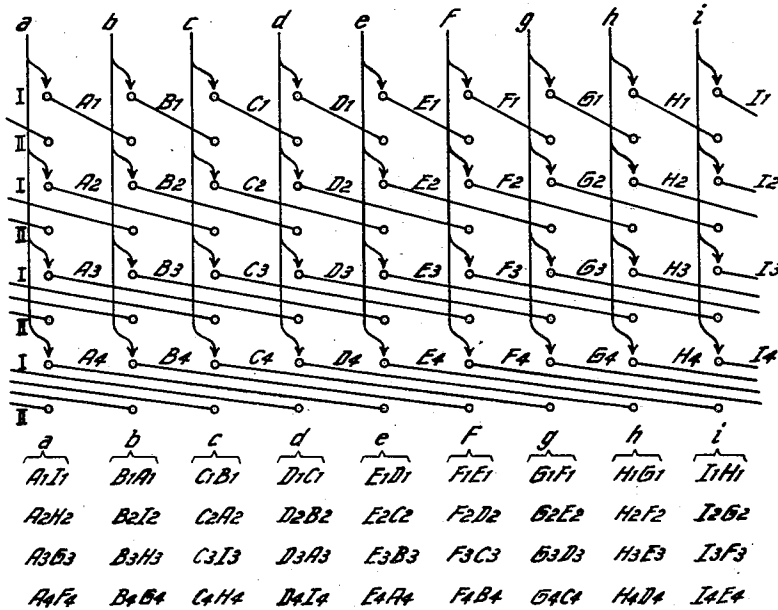
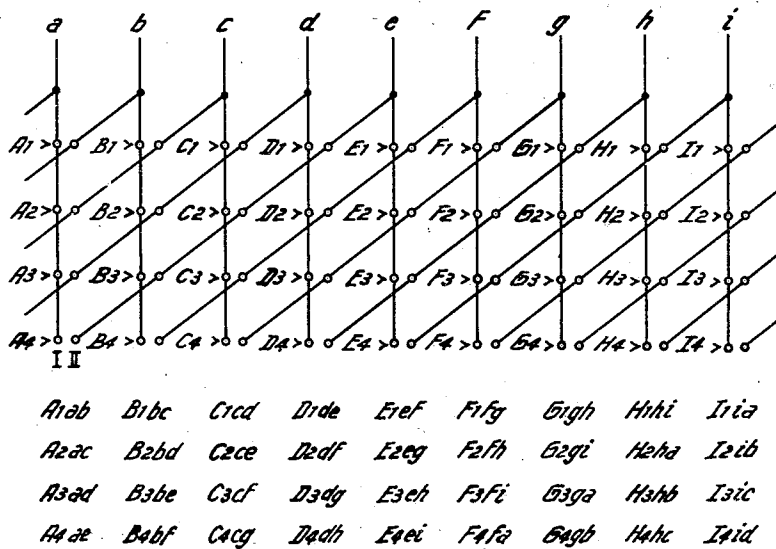


Fig. 4a



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Fig. 6

<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>de</i>	<i>ef</i>	<i>fg</i>	<i>gh</i>	<i>hi</i>
<i>ac</i>	<i>bd</i>	<i>ce</i>	<i>df</i>	<i>eg</i>	<i>fh</i>	<i>gi</i>	
<i>ad</i>	<i>be</i>	<i>cf</i>	<i>dg</i>	<i>eh</i>	<i>fi</i>		
<i>ae</i>	<i>bf</i>	<i>cg</i>	<i>dh</i>	<i>ei</i>			
<i>af</i>	<i>bg</i>	<i>ch</i>	<i>di</i>				
<i>ag</i>	<i>bh</i>	<i>ci</i>					
<i>ah</i>	<i>bi</i>						
<i>ai</i>							

Fig. 7

<i>ab</i>	<i>bc</i>	<i>cd</i>	<i>de</i>	<i>ef</i>	<i>fg</i>	<i>gh</i>	<i>hi</i>	<i>ia</i>
<i>ac</i>	<i>bd</i>	<i>ce</i>	<i>df</i>	<i>eg</i>	<i>fh</i>	<i>gi</i>	<i>ha</i>	<i>ib</i>
<i>ad</i>	<i>be</i>	<i>cf</i>	<i>dg</i>	<i>eh</i>	<i>fi</i>	<i>ga</i>	<i>hb</i>	<i>ic</i>
<i>ae</i>	<i>bf</i>	<i>cg</i>	<i>dh</i>	<i>ei</i>	<i>fa</i>	<i>gb</i>	<i>hc</i>	<i>id</i>

Fig. 5

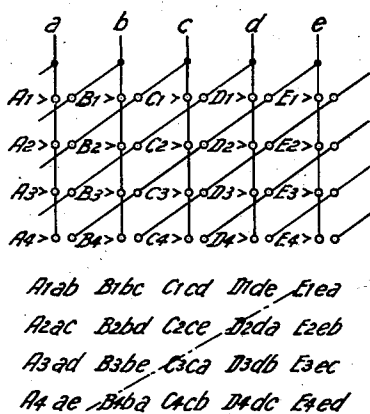


Fig. 8

<i>n</i>	$2n+1$	$n \cdot (2n+1)$
1	3	3
2	5	10
3	7	21
4	9	36
5	11	55
6	13	78
7	15	105
8	17	136
9	19	171
10	21	210

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UNITED STATES PATENT OFFICE

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TELEPHONE INSTALLATION

Friedrich Merk, Frankfort-on-the-Main,
GermanyApplication February 14, 1933, Serial No. 656,731
In Germany February 17, 1932

6 Claims. (Cl. 179—18)

The invention relates to telephonic selectors for groups of subscriber's lines and aims to provide an improved selector arrangement or means and principle of making connections.

5 Such groups are characterized by a very unequal ratio of the subscriber's lines to the connecting lines associated with them. The ratio is very disproportionate because the use of the subscriber's lines is small and cannot be increased, 10 whereas the connecting lines should be used as much as possible in so far as the presence of a larger number of subscriber's lines allows it. This requirement is satisfied if the ratio of the subscriber's lines to the connecting lines associated 15 with them is about 100 to 5 for ordinary traffic and about 100 to 9 for heavy traffic.

Selector devices for subscriber groups have hitherto been of two different or what might be called "opposite" constructions. In one case, the 20 devices for the outgoing and incoming traffic to and from subscribers are made as small but very numerous selectors, whereas in the other case, for the same purpose, considerably fewer, but very large and costly selectors are used. In so far as 25 in this way the said ratio is satisfied, the result is only less economical than it is efficient.

The object of the invention is a technical and economical and, at the same time, satisfactory construction and arrangement of the selector device 30 vice for subscriber groups. This is brought about by a multiple connection arrangement in which an auxiliary group, known in itself, is brought into use together with selectors of a medium size in a fully effective and generally useful construction. 35

According to the invention, double groups of selectable lines (subscriber's lines or the connecting lines associated with them) are made accessible in a combination varying from selector group 40 to selector group, by making the selectable lines within the selector groups as two smaller partial multiples (I, II) and, at the same time, joining each of these partial multiples in parallel with a partial multiple of another group of selectors.

45 This connection arrangement is mainly intended for use in call seekers and line selectors. It is however, if desired, suitable also for pre-selectors together with a staggering of some of the selectable lines. In any case, with the connection arrangement, an efficiency is obtained which allows 50 a grouping together of the lines in the ratio mentioned at the beginning to be obtained directly in the multiple having selectors of medium size, that is to say, without additional distributing switches. 55 This is the main advantage of the invention. It is

obtained together with another big advantage which consists in that the connection arrangement can also be used for line selectors and can itself be easily inserted in selector systems with subscriber's lines divided into groups of ten. 60 Altogether, the invention makes it possible to restrict the selectors for the incoming and outgoing subscriber traffic to approximately the same small number that has already been obtained in the switching step of the selector groups in a different connection arrangement. (See German Pat- 65 ents Nos. 227,561 and 279,020.)

It will facilitate understanding to here state that no particular type or construction of selector is required for the purposes of the invention, as 70 such is quite immaterial. It is necessary only that the selector have a contact field so constructed that two equally large conductor or line groups may be connected with it. This might necessitate making the selector twice as large, that is, 75 providing additional brush sets and contacts for double the number of connections, but there would of course be no difficulty in so doing. In other words, in place of the usual type of selector having a 100 part contact field, the invention con- 80 templates or presumes a selector having a 200 part contact field. A selector suitably adapted or adaptable to the purpose is shown for example in my prior Patent No. 1,912,087 dated May 30, 1933, referring particularly to Figs. 1 and 3. 85

The invention will be best understood by further description with reference to the attached drawings illustrating the same diagrammatically.

In said drawings:

Fig. 1 represents several groups of selectable 90 lines as connecting with associated groups of selecting lines;

Fig. 1a represents a reverse connecting arrangement;

Fig. 2 represents an arrangement wherein the 95 selectable lines are divided into sub-groups;

Fig. 2a represents a reverse switching arrangement of this sub-group division;

Figs. 3 and 3a illustrate the above mentioned arrangement for a larger number of selector 100 groups;

Fig. 4 represents an improved form of connection arrangement for a multiple of lines in accordance with the principle involved;

Fig. 4a illustrates a modification of the latter 105 and exemplifies a practicable table of symbols advantageously used;

Fig. 5 illustrates an adaptation of the connections of the preceding figure with only five groups 110 of selectors, together with a table;

Fig. 6 exemplifies possible combinations of the table symbols;

Fig. 7 exemplifies variations of the table of Fig. 6; and

Fig. 8 is a further illustration of the table use.

In Figure 1, the lines A, B and C indicate three groups of subscriber's lines which cyclically connect together any two partial multiples marked with small circles I, II of three call seeking groups. The lines *a*, *b*, *c*, indicate three groups of connecting lines to which are connected the call seeking groups indicated by arrows. The arrow-heads give the engaging position of the call seeker. Here, as in all the following figures, selectors with a zero position are assumed, so that the arrow-heads indicate, at the same time, the sequence for the covering of the partial multiples I and II lying one below the other. As a consequence of the visible restriction of the groups of lines A, B and C, each of these groups in one of the call seeking groups appears in the partial multiple I and in the other in the partial multiple II. The calls from any subscriber group can thus be made from any two groups of call seekers. By a suitable setting up of the starting circuit for the call seekers, the calls, for example, from the subscriber group A, can be made from the (appropriate) call seeking group *a* until all call seekers in this group are occupied. During this time, further incoming calls from the the same subscriber group A are transferred by the starting circuit switched in in the meantime to the call seeking group *b* for auxiliary operation. The call seeking group *b* can thus obtain the desired assistance because the subscribers of the group B can obtain any necessary assistance from the call seeking group *c*.

Should there be no third call seeking group *c* and the multiple switch be made merely with two groups of call seekers *a* and *b*, the subscriber group B would no longer be able to deal with a call during the occupancy of the two call seeking groups *a* and *b*. The multiple of the call seeking groups *a* and *b* would, in this case be a usual restricted multiple of the line groups A and B, which does not fall within the scope of the invention. The invention provides moreover a line multiple for the selector groups, the groups of lines of which are made accessible in different combinations. In the construction of such line multiples, at least three groups of selectors as in Figure 1 are necessary. In this way, it will thus first be possible, with the same number and size of selectors in the groups, to be able to make proportionately more calls than with only two groups. If, for example, five calls seekers are associated with each of the subscriber groups A, B, C, with the subscriber group A, ten calls can be made from the call seeking groups *a* and *b* together, while at the same time, in the subscriber group B, five further calls can be made through the call seeker of the group *c*.

In the reverse connection arrangement of Figure 1*a* in which the selecting and the selectable lines are oppositely arranged, groups of subscriber's lines are again indicated at A, B and C, which end at preselectors indicated by their arrows, while in the selector multiple there are two groups I and II of the connecting lines *a*, *b*, *c*. This connection arrangement, as regards the use of the connecting lines, operates like that of Figure 1. As regards the letters given together beneath the connection diagram of this and the other figures, an explanation is given later.

In Figure 2, contrary to Figure 1, the groups of subscriber's lines are divided into sub-groups A1

to A4, B1 to B4 and C1 to C4. Accordingly, the partial multiples I, II are also divided up into sub-groups. The several arrows branching from the connecting lines *a*, *b*, *c*, represent the sets of brushes of the call seekers in the form of multiple brush selectors or of small call seekers connected in parallel, both of which are in themselves known. Upon a call being made from one of the subscriber groups, the brush set of a call seeker of the particular sub-group appertaining to the appropriate call should always, in any case, be effective. For the rest, the switch device operates as regards the use of the connecting lines *a*, *b*, *c*, similarly to that of Figure 1, that is to say, the use of the connecting lines will in this case not be influenced by the division of the subscriber lines into sub-groups.

In the reverse switch arrangement of Figure 2*a*, A1 to A4, B1 to B4, C1 to C4 indicate sub-groups of preselectors, to which corresponds the multiple of Figure 1*a*, and thus has likewise the same operation.

Figures 3 and 3*a* illustrate the use of the above mentioned switch arrangement for a larger number of groups of selectors and lines, the increase of which enlarges the efficiency of the connection arrangement. If it is assumed in Figure 3 that there are again five call seekers in the subscriber groups, twenty calls are now possible simultaneously in three neighbouring subscriber groups, namely, for example, ten calls in the subscriber groups A1 to A4 which are made through the call seekers of the groups of lines *a* and *b*; five calls in the subscriber groups B1 to B4 which are made from the call seekers of the groups of lines *c*, and further, five calls in the subscriber groups C1 to C4 which are made from the call seekers of the groups of lines *d*. In the remaining subscriber groups, simultaneous calls are likewise possible in similar fashion. The same applies also to the connections in Figure 3*a*. The group of lines in these two and in the following similar figures entering at the left in the first selector group forms the continuation of the group of lines on the right leaving the last group of selectors.

At this stage will be seen the remarkable property of the connection arrangement in accordance with the invention, namely, that the individual subscriber groups are continually operated by the connecting devices of the following subscriber group at the same rate at which their own connecting devices are taken from them by the previous subscriber group. This compensation of the connection arrangement in accordance with the invention arises out of the corresponding or identical construction of the partial multiples I, II of the selector groups. This compensation of the connection device is also apparent from the fact that no alteration is made in the efficiency if the partial multiples I, II were arranged in the reverse sequence in all the selector groups or if in Figure 3, the calls were distributed from the subscriber groups alternately to their own and to the following call seeker groups as again was indicated in Figures 3*a*, namely with the connecting lines of the partial multiples I and II arranged in a mixed sequence.

The identical construction of the partial multiples is of particular importance for the efficiency and general use of the connection arrangement in accordance with the invention. More will be said about this later.

In the connection arrangements previously mentioned, having subscriber lines divided into

sub-groups (Figures 2, 3, and 2a, 3a), the selectable groups of lines in all sub-groups of their partial multiples I, II are connected in a similar way at any two selector groups. In the same way, in the individual selector groups, a combination of their multiples occurs with any two similar selectable groups of lines. This identical connecting is illustrated in the drawings by the parallel running of the lines which indicate the selectable groups of lines.

The invention is not restricted to this identical parallel connection of the partial multiples I, II in the sub-groups of the individual groups of subscriber's lines. On the contrary, the existence of sub-groups of subscriber's lines can be utilized to allow a change in the combination of the partial multiples I and II to occur also in the sub-groups of the subscriber's lines. In this way, a double variation in the combination (mixing) of the selectable groups of lines in the partial multiples I and II, is obtained, namely, once between the selector groups and in addition within the selector groups. This form of construction is advantageous as regards the accessibility and the utilization of the connecting lines.

Figure 4 shows this improved form of construction of the connection arrangement in accordance with the invention for selectors with subscriber lines in the multiple. If this form of construction is compared with the corresponding one in Figure 3, it will be seen that the connecting lines for the subscriber groups in the partial multiple I of its own selector group are unaltered whereas the connecting lines in the partial multiple II for the sub-groups of each group of subscriber's lines lead to various other selector groups. This is to be seen from the dissimilar angle of inclination of the parallel lines which represent the sub-groups of the subscriber's lines.

In order to appreciate the better working of the arrangement of Figure 4, let it be assumed that the selectors are call seekers and that the groups of connecting lines *a, b, c, . . .* each have five lines and a like number of call seekers. From what has already been shown, namely, that with the arrangement of Figure 3, upon the same assumptions, a subscriber group has simultaneously ten connections, it can now be established that this number is increased in the arrangement of Figure 4 to twenty-five. For example, any subscriber in the subscriber groups A1 to A4 could connect to any one of the five call seekers of the group of connecting lines *a* and then any five subscribers in each of the sub-groups A1, A2, A3 and A4, could connect to any of all the call seekers of the subsequent four subscriber or connecting line groups *b* to *e*. This gives together the mentioned twenty-five simultaneous connections of the subscriber groups A1 to A4. If this examination is continued, it is seen that with calls from five neighbouring subscribed groups, the whole of the call seekers and connecting lines of groups *a, b, . . . i*, could be connected at the same time. The mentioned number of connections occurs, to be sure, only under specially favourable circumstances, but it serves, in any case, as a comparison of appreciating the advance made by the arrangement of Figure 4 compared with that of Figure 3.

In the reversed form of the same connection arrangement for preselectors of Figure 4a, the previously mentioned modification in the line junctions in the partial multiple II is indicated by the obliquely running branches of the groups of connecting lines *a, b, c, . . .*

For the explanation of the operation of the connection arrangement of Figure 4a, the sloping branches of the groups of lines *a, b, c, . . .* may, for the moment, be imagined not to be present so that the vertically running branches within the selector groups consist merely of independent, pure line multiples. These multiples may be regarded as the first half of bundles of double the number of lines. It is known that the first half bundles of line, if they are small and, for example, contain only five to ten lines, cope with about 90% of the greatest traffic of the groups of double the number of lines. If this supposition that the groups of lines *a, b, c, . . .* constitute an independent first half of a bundle is maintained, there can be no doubt that this half bundle with the partial multiple I copes alone with the greatest traffic of the busy hour with a remainder of about 10%. The use of the half bundle thus obtained is so good that it is fully satisfactory and does not require any further improvement, as for the excess traffic that cannot be coped with by the half bundles, a group assistance is provided. The carrying into effect of this assistance is due to the fact that within a large number of selector groups, the average traffic during the busy hour is smaller than the previously assumed greatest traffic of one selector group and that accordingly also the excess traffic is smaller than 10% of the latter. In accordance with the invention therefore, the obliquely running branches in Figure 4a of the same groups of lines *a, b, c, . . .* with the partial multiple II provided are for the auxiliary groups. The selectors themselves have accordingly a contact field which would, in any case, be necessary in the usual total bundle, while the multiplied groups of lines in the selectors are restricted for the same traffic density to half the number of lines.

The table in Figure 4a shows a scheme for making up the connection arrangement by a juxtaposition of the symbols of the selecting and selectable groups of lines. The combinations of letters show with which selectable groups of lines the individual sub-groups of selectors, or their leads, are related. For example, the term *A1ab*, indicates that the sub-selector group A1 can connect with the two line groups *a* and *b*. If all the letter combinations are therefore considered it will be seen that they are combinations of second class without repetition of the 9 elements or letters *a, b, . . . i*. Figure 6 shows the combinations in the already known arrangement. In Figure 7, the same are arranged for the present purpose, in that the series of combinations given above the line are added to the combinations below the dotted line in Figure 6 and are written down as inversions. In Figure 7 the inversions are underlined. They apply to those groups of lines which return from the last to the first group of selectors. The form and arrangement of the combinations in Figure 7 agree entirely with those in Figure 4a. The connection diagram of Figure 4a can therefore be obtained directly also from Figure 7 if like figures are joined to each other by lines and for each letter a point is placed as a symbol for a partial multiple.

A similar analytical deduction should now be made for the connection arrangement of Figure 4. For this purpose, the capital letters occurring in the combinations in the table of Figure 4a, are grouped with the individual small letters, *a, b, c, . . .*. In this way, for example for the letter *a* from the individual transverse rows of

the table of Figure 4a, the new series of combinations a ($A111+A2H2+A3G3+A4F4$) is obtained. This expression indicates that the group of lines a now representing a selector group can be connected to the combination pairs of sub-groups of lines in the brackets which previously were sub-groups of preselectors. Similarly, series of combinations can be made for the other groups of conductors $b, c \dots i$. The series are collected in the table of Figure 4 and correspond with the appropriate connection arrangement. This contains nine groups of selectors with thirty-six sub-groups of lines in the multiple; while in Figure 4a, on the contrary, thirty-six sub-groups of selectors with nine groups of lines in the multiple are contained. In each group of selectors of Figure 4, there are four sub-groups of subscriber lines combined in pairs. They are corresponding inversions of the combinations contained in Figure 4a and show the small letters exchanged with the corresponding capital letters. The previous similarity between the combinations of Figures 4 and 4a shows the existence of the same law of formation also for both connection arrangements, so that these can be connected with the same effectiveness.

If, in the arrangements of Figures 4 and 4a generally the series $n=1$ to $n=10$ is given to the sub-group number; this gives for the group number and for the sum of all combinations of second class without repetition resulting therefrom the numbers given in the table of Figure 8 under the headings $2n+1$ or $n(2n+1)$; $n=1$ being the smallest value with which the invention is concerned. This value corresponds to the connections of Figures 1, 2 and 1a, 2a. $n=4$ is the basic value for the connections of Figures 4 and 4a. The value $n=10$ is, practically, of special interest because it applies to selector systems with decimal group sub-division. In this case, there are 100 groups each with 10 groups of 10 as sub-groups, the multiple of which, in full use, of all combinations of 21 groups of 100. To each group of 100, there are thus, according to the density of the traffic, 5 to 9 connecting lines which are either simple preselectors with 10 to 18 contacts or 5 to 9 call seekers with a contact field for twice 100 lines. As call seekers, if desired rotary lever selectors could be used with a multiple for twice 100 lines. The connection arrangement gives, with 21 groups of 100, an efficiency which approximates to that of the known double preselector arrangement and exceeds that of the largest mechanical selector for 500 lines provided as call seekers and line selectors.

An exact adherence to the numbers given for the groups and the sub-groups in the table of Figure 8 is not necessary. An addition to the number of groups relatively to a given number of sub-groups can, in any case, not be harmful but only useful. In this respect, reference is made to an earlier statement made in connection with Figures 3 and 3a. A subtraction from the number of groups relatively to a given number of groups can only have a result in connection arrangements similar to that in Figures 4 and 4a. In order to show this in an example, the connections shown in Figure 4a are reproduced in Figure 5 with only 5 groups of selectors. The table given in Figure 5 shows that the combinations obtained therein are double, half of them being inversions. Variations from the previous combinations are made in this way which give the following special features in the arrange-

ment of Figure 5. The sub-groups of these pairs of selectors, for example A1 and B4, contain the same groups of connecting lines, but the multiple of all the selector groups, as provided by the invention, makes different combinations. Thus, the efficiency of the connection arrangement of Figure 5, apart from a small diminution, remains therefore at a satisfactory level compared with that of Figure 4a.

For the use of the connection arrangement in accordance with the invention for line selectors, the arrangements for selectors with subscriber lines in the multiple come into question. In this connection, it is stressed that there is nothing different in the making of the connections, so that all the previously mentioned characteristics when call seekers are used remain the same when line selectors are used. As multiple switches with auxiliary groups have not hitherto been unknown in line selectors as far as can be ascertained, it may be shown on the basis of Figure 4 how any seized sub-group of lines, for example B1, B2, B3 or B4 can be reached by number selection without translation. The choice of these sub-groups of lines depends in the first place, in the known way, on there being a free line in the prearranged group of selectors, and thus a line selector of group b is covered. Then, by the selection of a penultimate number, the setting of these line selectors on one of the said sub-groups of lines B1, B2, B3, B4 follows and hereafter through a final number selection the setting of the line selector on the desired individual line of the appropriate group. This goes on as long as there are sufficient line selectors in the group b available, and this is the case, according to an earlier explanation, with the majority of calls which occur during the busy hour. For further calls, a deviation to sub-groups of line selectors is necessary. For this purpose the special construction of the mixing multiple prepares particular groups of line selectors namely, the selector group c for calls to B1, the selector groups d for calls to B2, the selector groups e for calls to B3, and lastly the selector groups f for calls to B4. It will be seen from this example, that in the rows of line selector groups coupled together, the interval between those line selector groups for which a deviation is necessary for a call to take place and the sub-line selector group for the call, increases in accordance with the number of the desired sub-group, i. e. with the penultimate number selection. The sloping connecting path for each deviated call is thus obviously determined simply by number selection without translation. With this accomplishment in multiple shifting of the leads, it is immaterial how the lead selector itself is controlled and the means for adjusting the selector has therefore not been shown or described in detail.

When using the switching arrangement of Figure 3 for line selectors, there is no difference as regards coping with the peak traffic from the previous case. If, as previously, the subscriber sub-groups B1 to B4 are called, the majority of the connections again run through the partial multiple I of the group of line selectors b , where the above mentioned subscriber sub-groups in Figures 3 and 4 are similarly connected. Only in respect of the deviation of the calls for excess traffic in Figure 3 is there any difference from the previous case, which however, is simplified because the subscriber sub-groups B1 to B4 are all connected identically in the partial multiple II of the next following group of line selectors c . Thus, in Figure 3, only two connecting paths come into ques-

tion for all calls from any particular group of subscribers, one of which leads to the group of line selectors which is directly selected by a group selector, or must be deviated over the next following group of line selectors in the row of connections if such are present. In order to be able to find the desired subscriber both in the multiple I and also in the partial multiple II, under the same conditions of numerical selection it is necessary that the subscriber lines be connected in both partial multiples in the same numerical sequence.

I claim:—

1. A telephone installation comprising selectors divided into groups and lines divided into groups, said lines being adapted to be reached through the selectors and the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of equal size, two groups of lines being connected in the contact field of the selectors of one group of selectors, and each of these groups of lines being in addition connected in the contact field of the selectors of another selector group, the combination of line groups connected in the contact fields of the selectors varying from selector group to selector group.

2. A telephone installation comprising selectors divided into groups and lines divided into groups, said lines being adapted to be reached by the selectors and the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of equal size; said contact field consisting of two partial multiple fields of equal size, the lines of a group of lines being connected in the first partial multiple field of the selectors of a group of selectors, these lines being connected in addition in the second partial multiple field of the selectors of another group of selectors and the lines of one of the second group of lines being connected in the second partial multiple field of the selectors of the first said group of selectors, these lines being in addition connected in the first partial multiple of the selectors of a third selector group.

3. A telephone installation comprising selectors divided into groups and lines divided into groups and sub-groups, said lines being adapted to be reached by said selectors, the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of the same size; said contact field consisting of two partial multiple fields of the same size subdivided into sub-fields corresponding to the sub-groups of lines, the lines of the sub-groups of one group of lines being connected in the sub-fields of the first partial multiple field of the selectors of one selector group, these lines in addition being connected in the corresponding sub-fields of the second partial multiple field of the selectors of another group of selectors and the lines of the sub-groups of a second group of lines being connected in the sub-fields of the second partial multiple of the selectors of the first said

group of selectors, these lines in addition being connected in the corresponding sub-fields of the first partial multiple field of a third group of selectors.

4. A telephone installation comprising selectors divided into groups and lines divided into groups and sub-groups, said lines being adapted to be reached by said selectors, the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of the same size; this contact field consisting of two partial multiple fields of the same size, subdivided into sub-fields corresponding to the sub-groups of the lines, the lines of the sub-groups of one group of lines being connected in the sub-fields of the first partial multiple field of the selectors of one group of selectors, these lines in addition being connected in the sub-fields of the second partial multiple field of the selectors of several other groups of selectors.

5. A telephone installation comprising selectors divided into groups and lines divided into groups and sub-groups, said lines being adapted to be reached by said selectors, the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of the same size; this contact field consisting of two partial multiple fields of the same size divided into sub-fields corresponding to the sub-groups of the lines, the lines of the sub-groups of one of the first group of lines being connected in the sub-fields of the first partial multiple field of the selectors of one group of selectors, these lines in addition being connected in the sub-fields of the second partial multiple field of the selectors of several other selector groups alternately from sub-group to sub-group and in the sub-fields of the second partial multiple field of the selectors of each selector group only connected the lines of a single sub-group of this group of lines.

6. A telephone installation comprising selectors divided into groups and subscriber's lines divided into groups, said lines being adapted to be reached by said selectors, the selectors of each group being provided with a contact field adapted to connect the lines of two groups of lines of equal size, this contact field consisting of two partial multiple fields of equal size, the lines of two groups of lines being connected in the first and second partial multiple fields of the selectors of a group of selectors corresponding to the turn of their call numbers, the lines of said line group connected in the first partial multiple field of the selectors of said selector group being connected in addition in the second partial field of the selectors of a second selector group and the lines of the line group connected in the second partial multiple field of the selectors of said selector group being connected in the first partial field of the selectors of a third selector group, each corresponding to the turn of their call numbers.

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