1. The secondary sequence diagram C 47593 shows that the counting train AX, AY, AZ is controlled, during the period when AS is operated, by earths appearing on the "step on" line. The present diagram shows how earth appearing in sequence on three leads switched by AX, AY and AZ controls the three steps of each cycle of multiplication and signals the completion of each step by earthing the "step on" line.

2. The sequence of operations during a multiplication is:

   (a) the selection of a shift position, starting with shift B during the first cycle and finishing with shift J during the last cycle;

   (b) the selection of the conditions for a multiple transfer of the multiplicand or its complement, followed by operation of the transfer start relay;

   (c) when the multiplier is negative, a single transfer in the opposite sense to the multiple transfer. When the multiplier is positive no action is required and we return to (a).

3. When AS operates, the five order digits are marked out and checked, and AX operates. At the same time AA in the subsidiary counter is operated. Earth from AS 2.3 via AZ 2.1 - AX 25.26 - ED 24.23 - AL 22.21 to AA 22.23 - QMA 2.3 operates HBX, HBY and HBZ. (QMA and QMB operate in series with EM when the first address digit is checked.) The earth is extended over HBX 9.8 - HAX 7.8 - VR 4.3 - VSA 4.3 to the "step on" line.

4. The secondary sequence circuit operates AY and releases AX. Earth is marked out over AX 2.1 - AY 25.26 - ED 4.3 - MPD 1.2 via either EN or EP operated and ENT 5.4 normal. If EP is normal, i.e. if the multiplier is positive, EP 22.21 forwards the earth over EM 22.23 to operate GMN. GMN 23.22 forwards the same earth over GRO 21.22 - GLA 4.5 - GCA 7.8 - GF 1.2 to operate GST. GST 2.1 introduces a holding circuit for GST and when the required number of transfers have taken place GF is operated and GF 2.3 extends the earth to the "step on" line.

   Alternatively, if EP is operated, i.e. if the multiplier is negative, EP 22.23 forwards the earth over EM 8.9 to operate GMP. GMP 3.2 forwards the earth over GRO 24.25 - GLA 7.8 - GST 7.6 to operate GCA, etc. GCA 5.6 provides an alternative holding circuit for GCA, etc., GCA 9.8 extends the earth over GF 1.2 to operate GST as before. When GST operates GST 4.5 (see C 47585) completes another holding circuit for GCA, etc.

5. Earth on the "step on" line causes AZ to operate and AY to release. If the multiplier is negative EP is operated and EN released and earth extended over AY 2.1 - AZ 25.26 - MPD 25.24 - EN 25.24 - EM 25.26 to operate GRO. GRO 22.23 forwards this earth over GLA 4.5 to GCA 7. The previous step has operated GCA, etc., and held them in over GST 4.5 operated. Consequently GST must release and in turn release GCA, etc., before the third step earth can be forwarded over GCA 7.8. Again, since GST has now released the circuit checks that GF 1.2 restores to normal before the operating circuit for GST is completed. As before GST starts a single transfer, GRO controls circuits by which the register digit is supplied with a train of nine pulses, and finally GF operates to route the earth to the "step on" line.

When the multiplier is positive EN 25.26 and EM 28.29 return the earth directly to the "step on" line.

6. The interlocking arrangements for GCA, etc., GST and GF are provided to prevent the occurrence of faults caused by the third step earth finding GCA released but GST and GF not yet released and so stepping on the secondary sequence without waiting for a transfer. The circuit makes use of the fact that when a single transfer follows directly after a multiple transfer it is always in the opposite sense, i.e. GCA requires to be operated or released. The condition described above always requires GCA to release during the interval before the single transfer. In division the other condition is found, and then GST 7.6 ensures that GCB cannot start operating until GST has cleared down after the multiple transfer.

7. The sequence of shift, multiple transfer and single transfer repeats until the subsidiary counting train has AJ operated. The the next first step (AX operated and A 2 released) puts out earth to the order completed line and the primary sequence circuit.