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Design and functioning of a fully automatic morning alarm call system

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1. The significance of the morning alarm call service

In Switzerland the morning alarm call service developed, at quite an early stage, from the telephone operator's friendliness and willingness to help by calling a subscriber at his request, at a time previously agreed upon. This service to the customer is enjoying growing popularity, as is demonstrated by the fact that every day an average of 36,000 telephone subscribers have to be rung up early in the morning. This amounts to between 12 and 13 million morning call bookings a year; the handling of these calls necessitates 75 operators.

The increase in the number of morning call bookings over the last few years resulted in serious staffing problems. Therefore, attempts at the automatization of this service were made years ago already. Semi-automatic or fully automatic morning call facilities intended for subscribers who wanted to be called regularly at the same hour in the morning were developed. For these morning calls booked under a *subscription arrangement* special 'PTT type' morning call facilities are available at all exchanges having more than 5000 subscriber's lines. They take care of approximately 40 per cent of all morning call bookings.

But *individual morning call bookings* account for the greater part of this special type of telephone service. They cause our manual exchanges growing difficulties. The majority of these calls are booked in the evening between 9 and 12 p.m. and must be attended to in the morning between 5 and 7 a.m. This means night and early morning duty for our operators, which is far from popular these days.

As the enquiry service No. 11 was often overburdened or even completely blocked by the numerous bookings of morning alarm calls, the special service No. 166 was introduced to take care of them. This enabled these calls to be handled by semi-skilled casual staff.

Rationalization by full automatization of the calling procedure, i.e. by largely doing away with operator assistance, was studied for several years but was doomed to failure at first, as most Swiss automatic exchange systems did not permit the transmission of additional digits after the establishment of the connection.

It is only thanks to the latest advances in electronics that it has become possible faultlessly to transmit and analyze not only pure impulses, but also short impulse *peaks*. With this so-called 'click selection' even figures can be transmitted over a speech channel. This technique is being made use of in the fully automatic morning alarm call handling systems. However, click selection is only a temporary expedient, which it will be possible to discard once touch-tone or MFC dialling is available in the exchanges of Switzerland. The automatic systems which are gradually being introduced have therefore been designed for both dialling systems.

2. Development

After extensive projecting and tendering work, in which the specialists of the General Directorate of PTT actively participated, *Autophon Ltd,* Solothurn, was awarded the contract—in the summer of 1966—to develop a fully automatic morning alarm call handling system and to build a prototype plant designed for experimental use in the Solothurn telephone exchange. This firm was interested in this fascinating development contract on account of its long-standing work in the field of information processing and display.

Its 'Informatic' plant used in banks, stock exchanges, railway stations and airports necessitates extensive electronic control and storing systems for information display, which can be used as elements of data processing technology. In working out the morning alarm call handling project, previous experience could therefore be relied on, and a solution taking advantage of both the latest progress in electronics and of well-tried applications in related fields could be adopted.

At the outset, the standard size of a morning alarm call handling installation had to be determined. For reasons of greater flexibility the PTT specified a building block system, the smallest installation consisting of one standard unit, and the largest, of a number of such units. According to PTT planning, Zurich is ultimately to have the largest morning call handling system. In its initial stage, as of 30th June 1971, it included 10 units.

After about three years of development and technical trials, a prototype consisting of one basic unit was placed in service at Solothurn in September 1969. During the initial experimental period of operation, development work was completed and construction work on the Zurich installation was taken in hand.

3. Design and functioning

The system is illustrated by the diagram of *figure 1,* which represents a basic unit including two input units, 560 call booking storage positions and ten output units.

The input units are used for call booking by means of the subscriber's ordinary telephone instrument. The subscriber dials No. 166 and is switched through the telephone exchange to the morning call installation. Then the speaking machine asks him to dial his own number and the exact time at which he wishes to be called (for instance 0630). This information is recorded in the store. The complete call booking details are then confirmed to the subscriber by a tape recorder.

Entry of the bookings can be effected over two parallel input units. The bookings are stored in so-called core storages *(fig. 2),* which are the central feature of the system. The handling capacity of the basic unit is 560 bookings, so

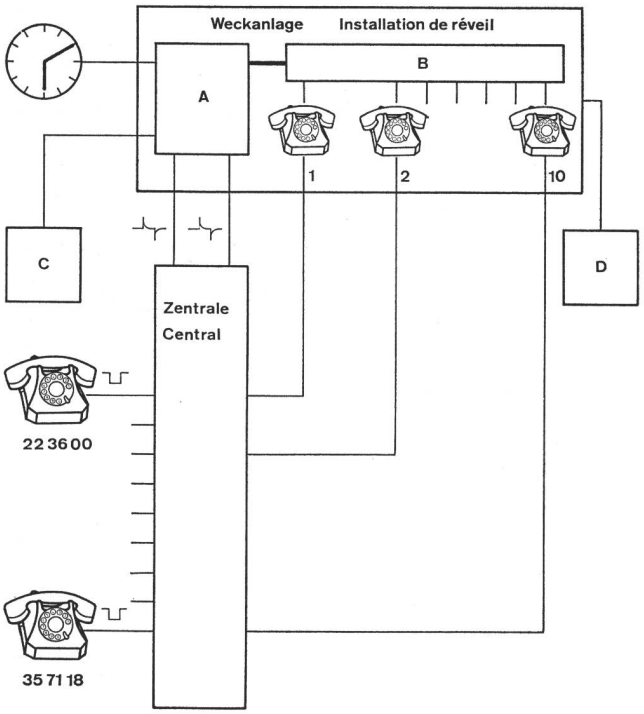

Fig. 1
Diagram of the automatic morning alarm call system

A Electronic storage for subscriber's number and call time
B Automatic output units C Speaking machine D Speaking clock
Weckanlage – Alarm call system Zentrale – Exchange

that the Zurich facility with its ten basic units accommodates storage locations for 5600 morning alarm call bookings. This is equivalent to the storage volume of a small computer having a capacity of approximately 300,000 bits.

The morning call bookings dialled by the subscribers are electronically compared with the exact time every 10 minutes. When the times tally, the morning call booking is removed from the core storage and transferred to the 'automatic switching equipment' output unit. This unit is equivalent, in the case of the Zurich facility, to 100 most efficient operators handling one morning call after the other in rapid succession and without any pause, by ringing the subscriber number and bidding good morning after the fashion of the Speaking Clock. If more than 100 persons are to be rung up at the same time, some staggering cannot be avoided so that in the event of a very large number of simultaneous orders some minutes' delay in the handling of some calls may result.

The facility incorporates some special features. For instance, it precludes the calling of a subscriber at an impossible hour through, say, the interference of a malevolent neighbour, by checking, at the time the call is booked, whether the call actually comes from the telephone number which is to be rung.

If a call cannot be completed because

- the lines or the subscriber to be called are busy,
- there is a fault somewhere,
- the call has not been answered after a minute's ringing,

the facility repeats the call at the end of 10 minutes. If the second attempt is again unsuccessful, for one of the above reasons, this is recorded in the store, next to the subscriber number and the time of the call, the reason for the failure (one of the three mentioned above) being expressly stated. In the event of later complaints, the cause of the failure or the unrightfulness of the complaint can thus be established.

Standing orders for morning alarm calls (subscription service) are also handled by the facility but cannot be dialled by the subscriber directly. They have to be registered with No. 11, from where they are fed to the store over separate control circuits by a special control unit *(fig. 3)*. The facility itself requires no special adjustments for this. This regular morning alarm service is available for calls on the following days of the week:

- every day
- Monday to Friday
- Monday to Saturday
- Tuesday to Saturday
- Tuesday to Friday.

Under this subscription arrangement customers may cancel the morning call for the day following the cancelling order—also through the intermediary of No. 11. The procedure for calls booked under the standing order arrangement is the same as in the case of individual morning call bookings.

One and the same subscriber can book several morning alarm calls, to be made at different times; these calls—and

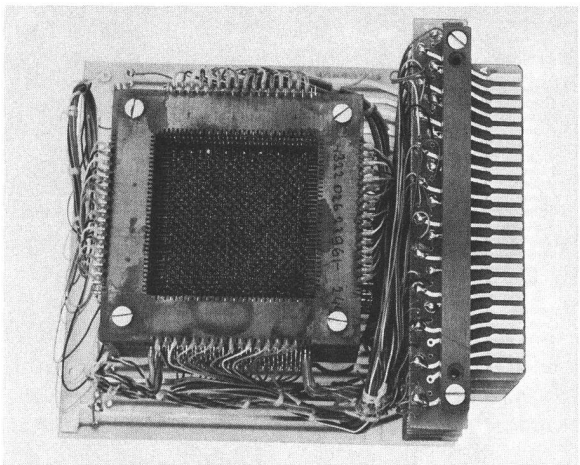

Fig. 2
Core storage, the central feature of the system

Fig. 3
Special control unit

cancellations in respect of them—are entirely independent from one another. In order to trace a specified booking in the store without any possible error, the operator will have to be advised of the exact time of the call whenever complaints are made or cancelling instructions given.

The control unit permits checking whether a specified call has been booked and whether and how it has been attended to; it also permits cancelling the call. Moreover,

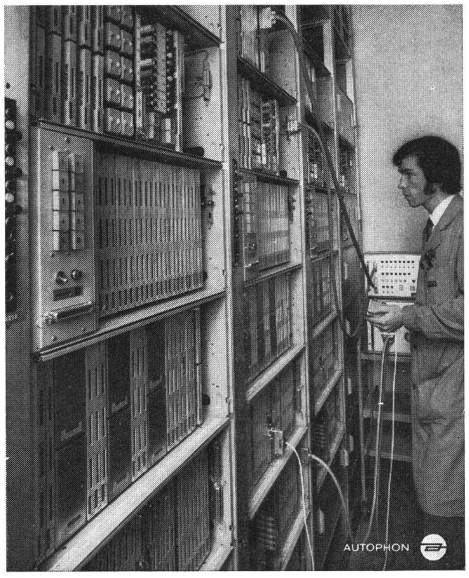

Fig. 4
Part of the installations at Zurich

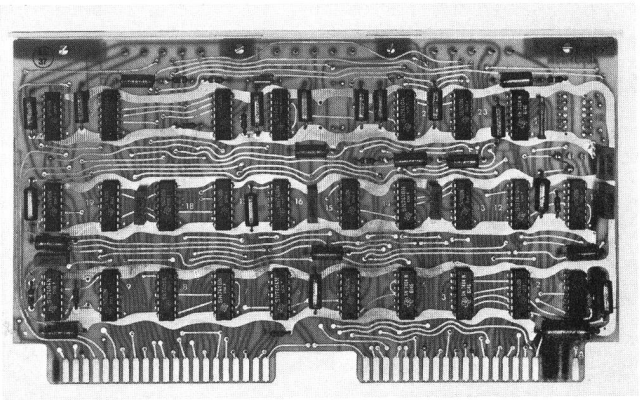

Fig. 5
One of the plug-in printed circuits

it records the total number of ineffective calls, stating the reasons why they have failed to mature, and the number of calls which have still to be completed.

4. Constructional features

The installation, which is shown in *fig. 4,* is built into standard PTT racks. The basic unit accommodating 560 morning call bookings fills one rack and is subdivided into 8 chassis-units. Besides core storage units, feeding devices and measuring and control elements, the facility includes a large number of plug-in printed circuits *(fig. 5),* on which the most advanced electronic components, such as integrated circuits, transistors, diodes, condensers and resistors are mounted. In addition, electromagnetic relays, still heavily relied on in telephone exchanges and in traditional switching techniques, are being used in this facility for the performance of some special duties.

In view of the high technical standard of the plant and the reliability of the components used—besides the 300,000 core storage elements the system includes 18,000 integrated circuits and over 50,000 other switching elements—a good functioning of the installation may be expected.

5. Final remarks

At present the two morning alarm call handling facilities operating in Solothurn and Zurich take care of about 6000 calls daily. They have resulted in the saving of some 12 operators, who can be made available to other services. By the end of 1973 all 17 Regional Telephone Directorates should be equipped with such automatic systems, which will be a major contribution to the modernization and rationalization efforts of the Swiss PTT. This novelty has aroused considerable interest even outside the Swiss borders, where the morning alarm call service is still in its infancy, or non-existent.