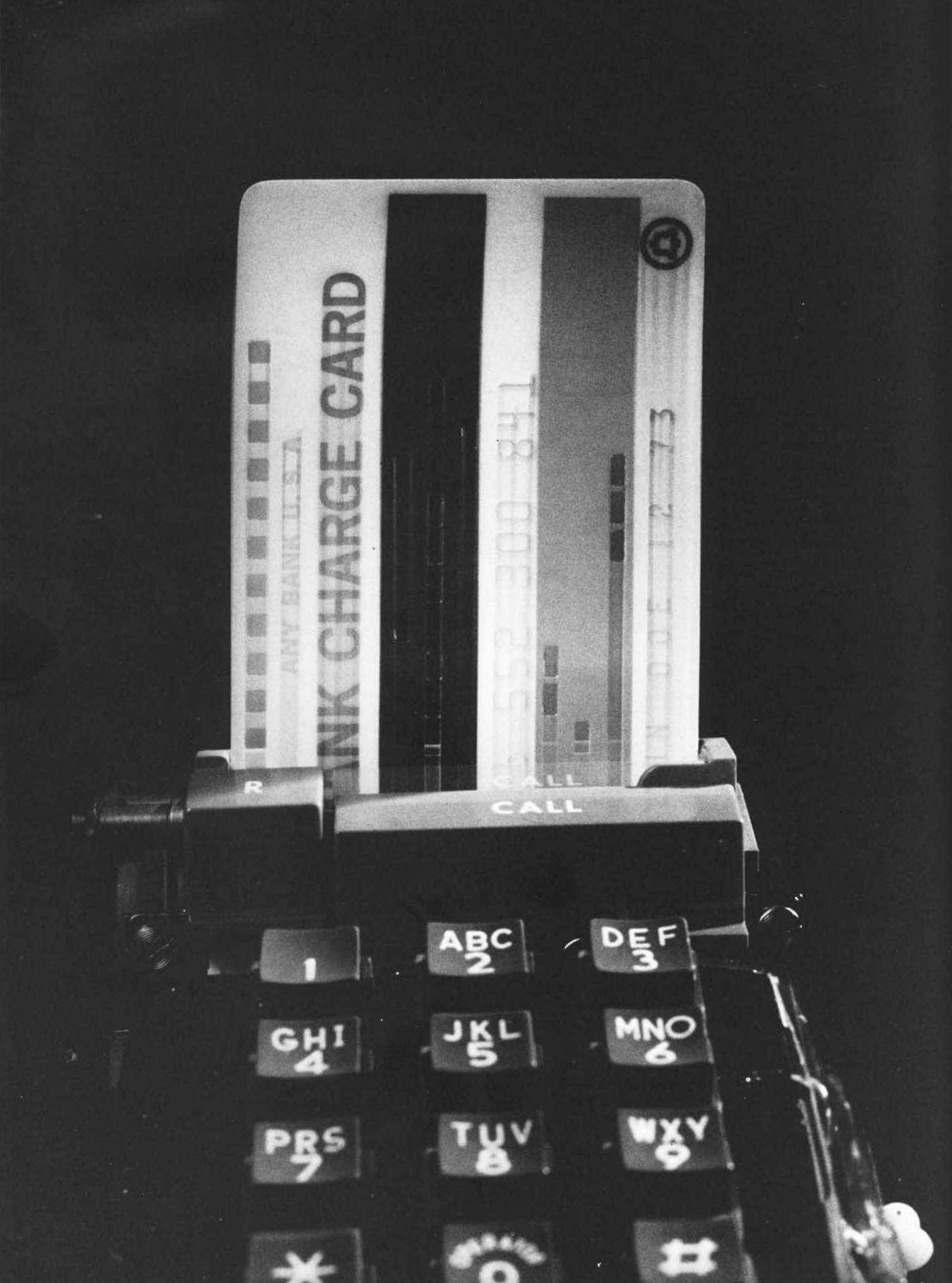

ANY BANK U.S.A.
NK CHARGE CARD
CALL
CALL
1
ABC 2
DEF 3
GHI 4
JKL 5
MNO 6
PRS 7
TUV 8
WXY 9

A TOUCH-TONE® *card-dialer telephone, developed to dial frequently-called numbers automatically, has been redesigned to permit its use as an inexpensive data terminal. The new card-dialer telephone may help automate many consumer and business chores.*

A Telephone for the "Checkless" Society

Terry Prince and Dan Miller

IMAGINE YOU ARE A CUSTOMER who wants to order several items for a new home. You dial the department store and a series of item numbers, insert a credit card into a slot in the telephone, press a button, and hang up. The order has been placed and the bill paid. You have no bother with handling cash or checks, making extra trips to the store, or mailing a payment. The telephone has helped with the chore.

The telephone that could make this convenience possible is a new TOUCH-TONE® credit-card dialer. Nearly a decade ago, Bell Laboratories developed a telephone which allows a customer to dial automatically with the use of punched cards (see TOUCH-TONE® *Card Dialer Set,* RECORD, *July/August 1963*). Now Bell Labs' Indianapolis Laboratory has developed a new telephone set that reads punched holes in credit cards or other cards of the same size. This new dialer, in addition to its capability of dialing telephone numbers automatically, can read and transmit information—coded by the punched holes in the credit card—over telephone lines. Western Electric is currently manufacturing the set.

How will the credit-card dialer affect the consumer? It may hasten the day when credit and

The TOUCH-TONE® *credit-card dialer (shown on this page and the opposite page), developed by engineers at Bell Labs, could speed consumer and business chores such as the payment of bills, credit verification, and inventory control. Data, for example, could be punched in a credit card and transmitted over telephone circuits to a computerized account. The completely automated process could help eliminate much of the vast amount of paper that is now produced by credit slips and checks.*

cash transactions and paying of bills are done immediately by transferring funds from one computerized account to another. Since the process would be completely automated, the mountains of paper now produced by credit slips and checks could be eliminated.

With the credit-card dialer, the consumer has an inexpensive data terminal operating a switching network that transmits information—encoded on bank account cards, credit cards, or billing cards—into computer storage. The dialer is also useful in business systems for production and inventory control, verification of bank accounts, and sundry other functions. Besides its advantage of reading punched credit cards and its small size, the card dialer telephone will operate reliably for many years.

The Touch-Tone credit-card dialer is a combination of a card reader and a standard Touch-Tone pushbutton dial. The set can be used to place calls automatically or manually. Two types of cards are available, and both are simple to use. A customer can punch perforations in specific slots of a molded card for telephone numbers that are frequently dialed, or he may obtain laminated cards pre-punched by machine with data.

The coding format for the hand-punchable cards is identical to that of the dial cards previously used for rotary and Touch-Tone dialers. Two coding fields (see figure on opposite page) are used to encode a digit. The row corresponding to the appropriate digit of the telephone number is punched in both the upper and lower fields of a column.

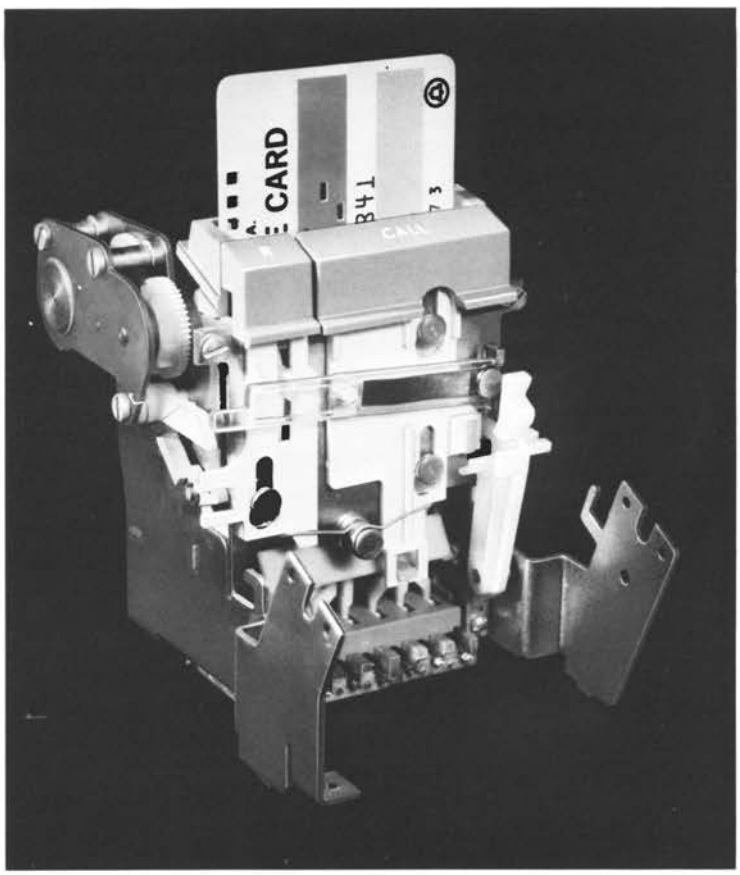
In addition to the ten digits, the card contains an expanded coding capability, including the "*" and "#" on the Touch-Tone telephone dial. These additional characters are suitable for data applications in business. In all, 16 different characters can be encoded by punching the appropriate slots on the card.

A row of holes labeled "stop," when punched between the columns of any two digits in a number, will stop the dialing sequence between those digits. The "stop" is punched, for example, to allow time for a second dial tone, such as in dialing a PBX access code "9."

Two changes were made in the format of the card to reduce its width to the size of a credit card, yet still leave enough space for other information, such as embossed numbers, magnetic stripes, logos, printing, etc. The shape of the holes is rectangular, instead of round, as in cards for earlier dialers, and now only a single row of sprocket holes is used to drive the card.

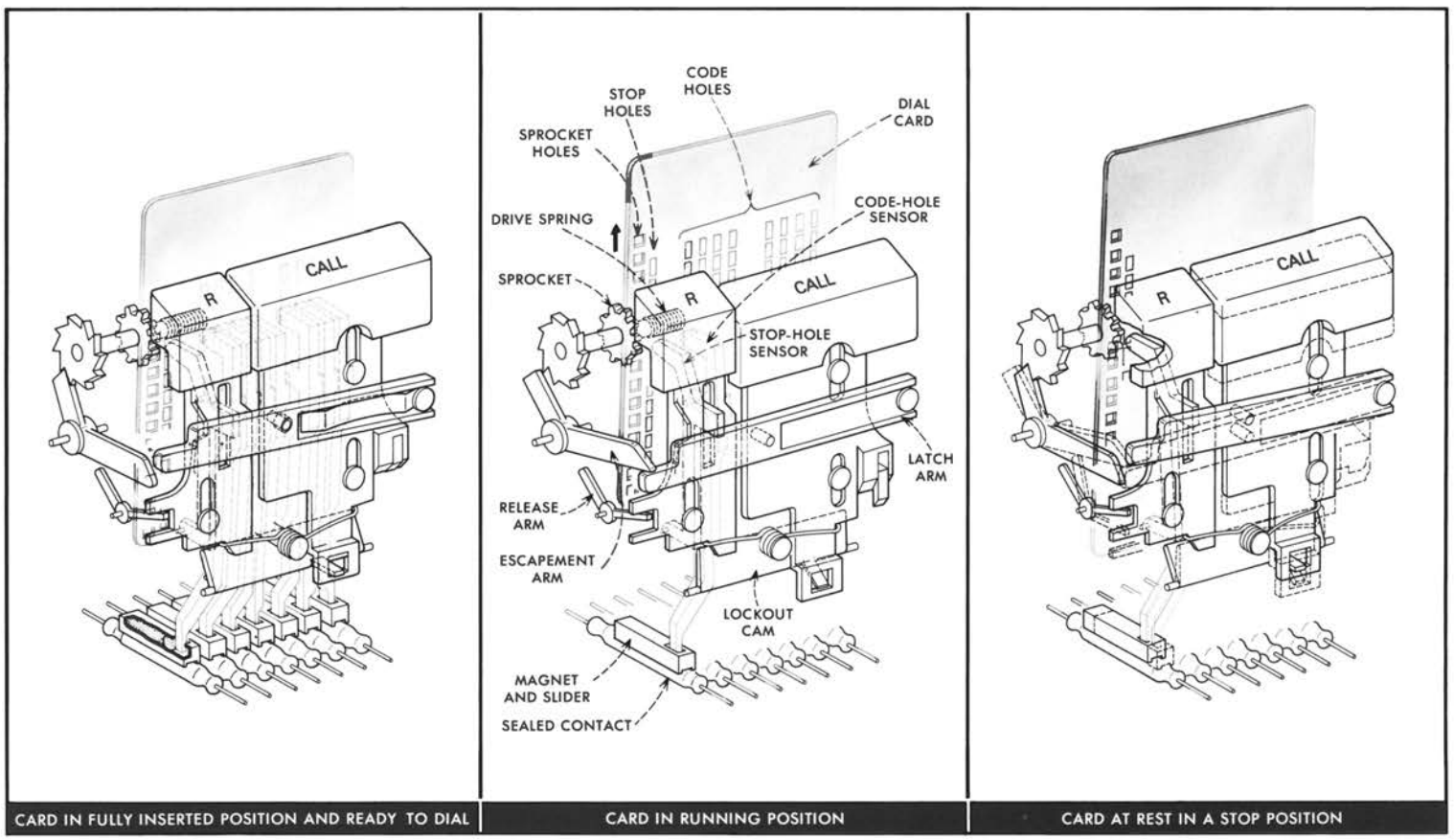
Cards used to transfer credit information are generally of the machine-punched type. Data can be embossed and printed along three rows of the card. Data, of course, can be printed anywhere on the card, so long as holes may still be punched in it. To allow space for embossing names, as specified for credit cards by the American National Standards Institute, the first row of characters in the upper coding field (1,2,3,a) need not be punched to activate a character in that row. If a row in the upper coding field is not punched, the code for the first row will be transmitted. The circuit connected to the Touch-Tone dial has been arranged so that those characters are always energized automatically when no other row in the upper field is punched. The hand-punchable card still contains perforations in the first row, however, to maintain the standard hand-punched coding used on all dial cards.

The reader mechanism in the card dialer reads the information from the card and translates it into electrical signals for transmission. The heart

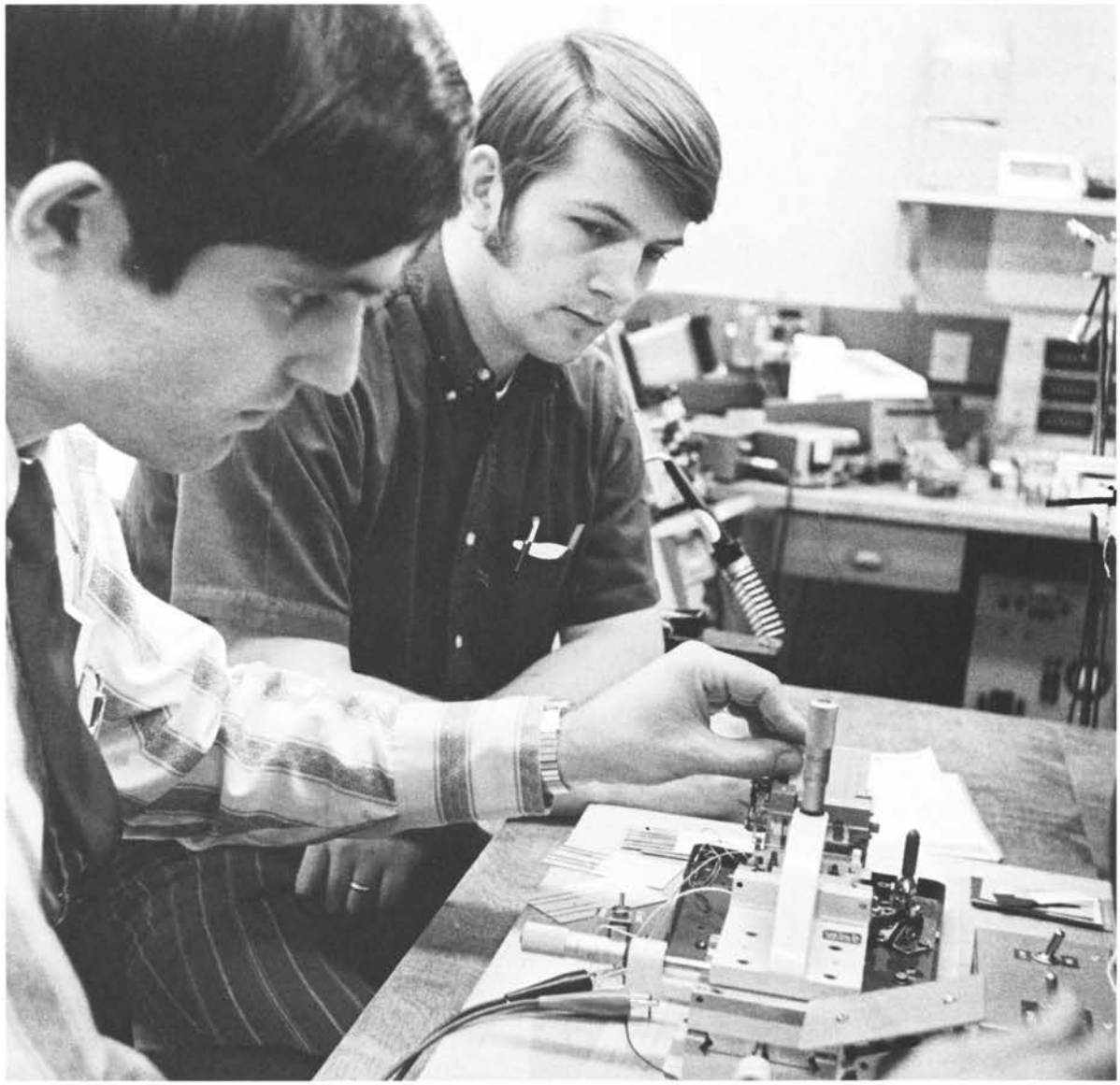


The drawings on the right show the mechanical operation of the credit-card dialer, the equivalent parts of which are shown in the photo above. In the left-hand drawing, a punched card is fully inserted in the telephone, ready for dialing. In the center drawing, the card is in the "running" position. And in the right-hand drawing, the card is in the "stop" position. To initiate a

One kind of card that could be used with the new credit-card dialer is shown at right. Credit information is encoded on the card as holes punched by machine. The information is transmitted into computer storage via the customer's card dialer telephone. A character of data is punched as two holes in a column —one hole punched in an upper coding field and one hole in a lower coding field. Information can also be embossed and printed on the face of the card. Another kind of card available allows the customer to punch holes himself for telephone numbers that he frequently dials. All cards are the size of credit cards.



call, a customer depresses the "call bar" (left). This action frees the "code-hole" sensors to fall into the holes in the punched card, as the sprocket and gear train drive the card out of the assembly (center). The sensors—spring-loaded rocker arms—pivot about a shaft as they flip into the holes. At the end of each rocker arm is a magnet, which slides along a sealed contact. As the switches in the sealed contacts open and close by the action of the sliding magnets, electrical signals are transmitted. An escapement arm is linked to a "stop-hole" sensor, so that when a hole is punched in the "stop" column, the card will automatically stop (right). The card can be withdrawn without transmitting electrical signals when the "reject bar" (R) is pushed.



Mike Willcox (front) and Steve Roehl, engineers in the Selective Dialing and Physical Design Group at Bell Labs, Indianapolis, test an exploratory device for adjusting sealed contacts in the card-dialer telephone. Shown in the foreground is a punch machine that encodes blank credit cards.

of the reading mechanism is the card-guide assembly (see figure on page 251). The assembly controls the position of a card with respect to "code-hole" sensors in the mechanism. The sensors are spring-loaded rocker arms which pivot about a shaft. A roller in a slot at the top of each arm rides along the front surface of the card. When a hole in the card is encountered, the roller slips down into the slot, and the arm pivots on its shaft.

Just below the bottom of each rocker arm is a sealed contact for long life and high reliability (see *The Sealed Contact Family*, RECORD, *August 1970*). A magnet at the end of the rocker arm slides along the sealed contact, opening and closing the switch. When the rocker arm pivots, the switch closes, transmitting a signal through the card-dial circuitry. One sealed contact exists for each of seven Touch-Tone frequencies. The tone-generating circuitry is described in more detail in another article (see *A Tone-Generating Integrated Circuit*, RECORD, *October/November 1966*).

Reliability is an important concern in designing

the mechanical components of the card dialer. Life testing and field data show that the greatest wear occurs on the "code-hole" sensors, and that they wear most rapidly when the card is inserted into the set. To eliminate wear while a card is inserted, a lockout cam on the card-guide assembly locks the seven rocker arms back so the rollers do not make contact with the card. The lockout cam remains back as long as the "call bar"—which activates the reading mechanism—remains up in its unoperated position. To initiate a call, a customer presses the "call bar" and the lockout cam releases, allowing the sensors to fall into the holes in the punched card. The rollers minimize wear as the card is being read.

Another important component of the reader mechanism is the gear train and frame assembly. With the aid of sprocket holes on the card and a motor spring, the gear train drives the card past the hole sensors. A governor controls the ejection speed of the card, a clutch allows fast insertion of the card, and a rotary switch determines the timing of the signals. By the action of the release arm of an escapement mechanism linked to the "stop-hole" sensor, the card stops and the "call bar" returns to the up position when a "stop" hole is encountered. To withdraw a card without transmitting the encoded digits, the customer pushes a "reject" bar. This feature is especially useful when a wrong card is inserted while transmitting data from a series of cards.

The credit-card dialers are available in single-line and six-button key designs. The sets are designed for modularity so that color-coded components can easily be installed or changed in the field. Also available are kits for converting the sets to a number of service features useful in business applications (see *Advances in the 1A2 Key Telephone System*, RECORD, *October 1970*). In data applications where only rotary-dial service is available, the credit-card dialer is available as an adjunct pad that can be wired into the rotary telephone set.

Systems using the credit-card dialer in conjunction with other apparatus are also being designed. One of these consists of connecting two one-number preset dialers, each linked to a card dialer (see *Programmed One-Number Telephones Place Calls Automatically*, RECORD, *May 1971*). With this kind of arrangement, fixed information such as the telephone number of a computer and the identification number of a business can be transmitted automatically by the preset dialers. The credit card number can be transmitted automatically by the card dialer, and variable kinds of information (such as dollar amounts) can be transmitted by manually operating the Touch-Tone dial. This system should satisfy the needs of most credit-checking stations.

Co-author Dan Miller runs a test on a TOUCH-TONE® *credit-card dialer mechanism in a room containing several assembled units at the Indianapolis, Indiana, location of Bell Laboratories.*

The future of card dialers looks very promising. Work is continuing on ways of communicating simply and quickly. Further improvements in the life and reliability of equipment are under investigation. The use of optical card readers and electronic memories is also being investigated. The credit-card dialer may bring the "checkless" society one step closer to reality.