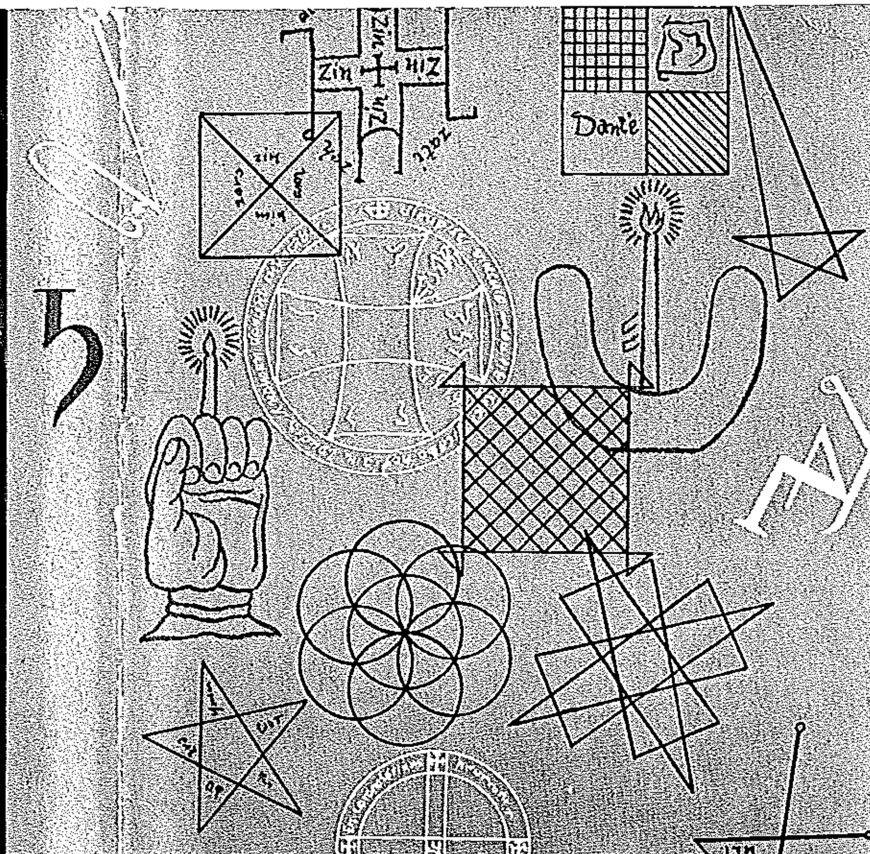
AUTOMATIC ELECTRIC
NORTHLAKE, ILLINOIS



relay magic

RELAYS • SWITCHES • CONTROL SYSTEMS

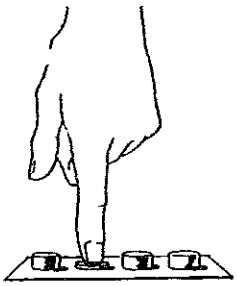
AUTOMATIC ELECTRIC

NORTHLAKE, ILLINOIS

1

relay magic

AE CAN DO



MAKING IDEAS WORK AUTOMATICALLY

FOREWORD

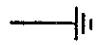
Relay Magic is one of a series of pocket books prepared by the Industrial Products Division of Automatic Electric. The booklets are designed to provide useful engineering information in a handy form. Others include **Relay Terms, Basic Circuits, Conversion Factors,** and **Tables & Formulae.**

We recommend that the information in this book be used only as a guide to determine the availability of a circuit and its components. Remember, even the best and most time-proven circuit may fail because of the wrong choice of equipment. For this reason we make no attempt to define specific electrical parameters or component values.

table of contents

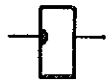
AE CAN DO

TABLE OF CONTENTS continued

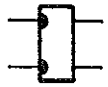


POSITIVE (GROUND)
(D. C.)

NEGATIVE (BATTERY)
(D. C.)

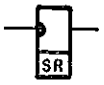


QUICK – ACTING
RELAY COIL



CONCENTRIC
DOUBLE WOUND
RELAY COIL

SLOW – OPERATE
RELAY COIL



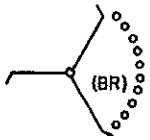
SLOW – RELEASE
RELAY COIL

DENOTES "IN"
TERMINAL

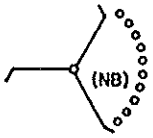
STEPPING SWITCH COIL
(MOTOR – MAGNET)

STEPPING SWITCH
INTERRUPTER CONTACTS

STEPPING SWITCH
OFF NORMAL CONTACTS
(SHOWN IN HOME
POSITION)

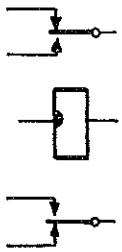


STEPPING SWITCH
BANK LEVEL
(BRIDGING)



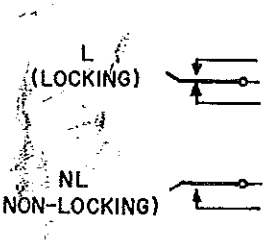
STEPPING SWITCH
BANK LEVEL
(NON – BRIDGING)

VARISTOR
(FOR CONTACT
PROTECTION)



CONTACTS IN A
VERTICAL LINE
WITH A COIL
ARE ACTUATED
BY THAT COIL.
LEVER SPRINGS
MOVE TOWARD THE
ACTUATING COIL

CONTACTS MARKED
"X" OPERATE FIRST
"Y" CONTACTS
OPERATE LAST



TELEPHONE – TYPE
LEVER KEY

Fig. 1. Symbols, abbreviations and drawing practices.

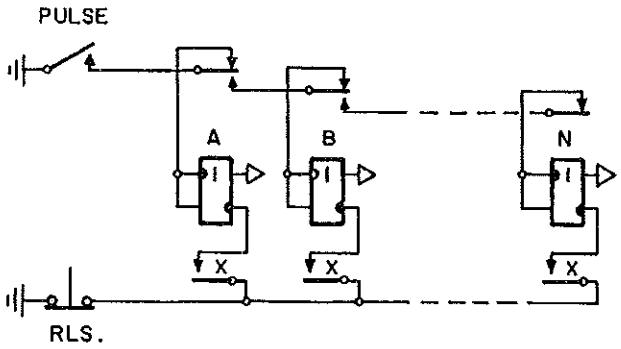


Fig. 2. Counting chain, one relay per step.

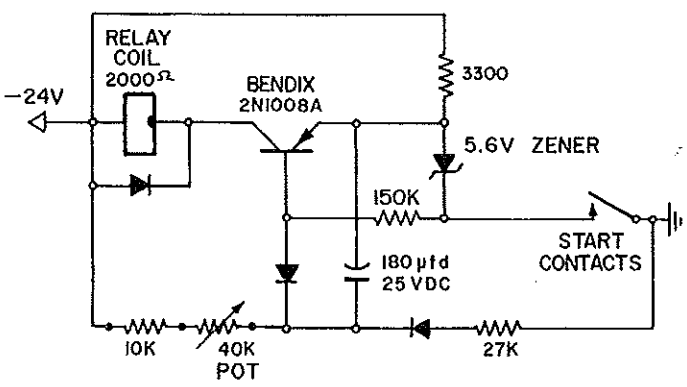


Fig. 3. Zener-stabilized slow-operate relay.

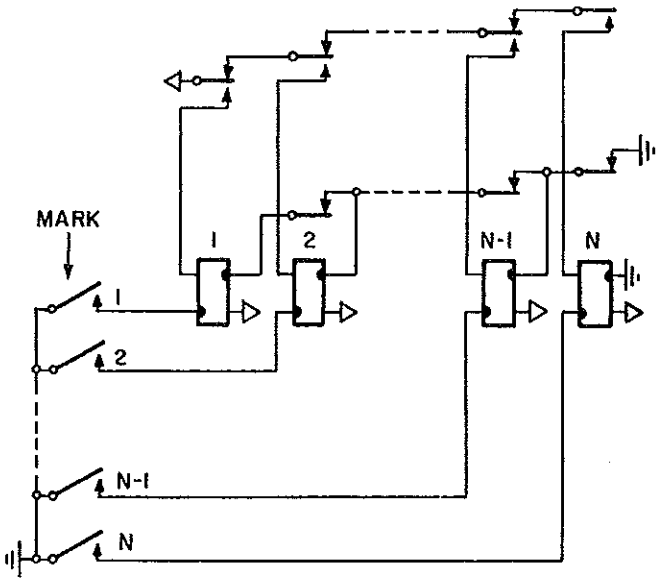


Fig. 4. Random or "jump" finder.

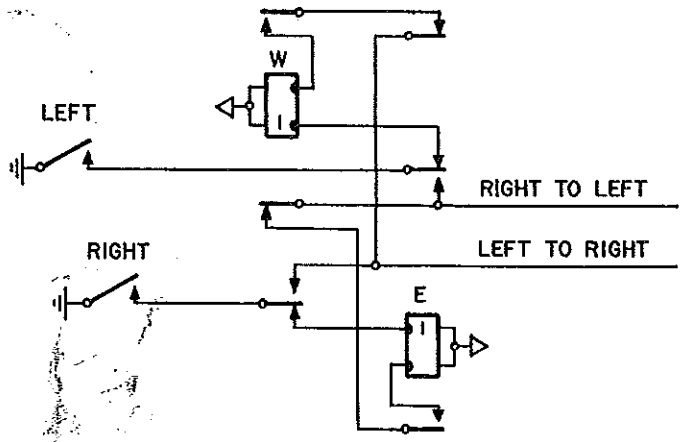


Fig. 5. Direction of phase marker.

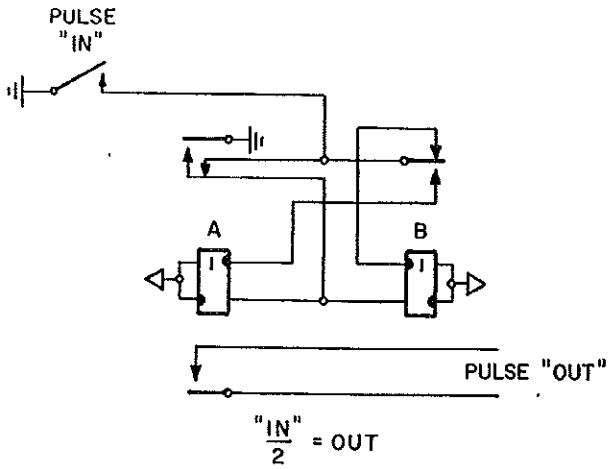


Fig. 6. Pulse divider (2-relay).

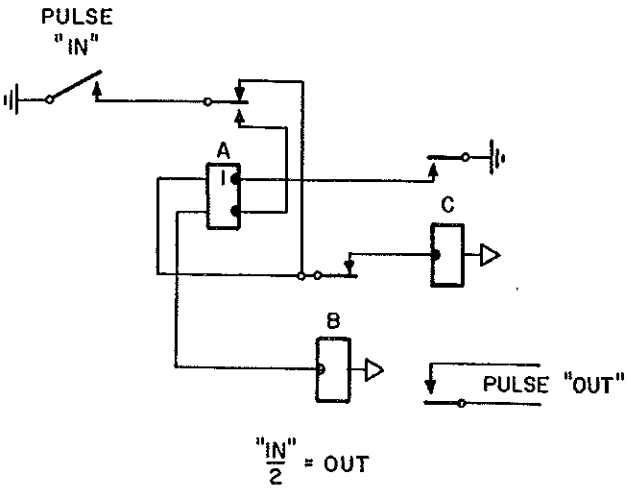


Fig. 7. Pulse divider (3-relay).

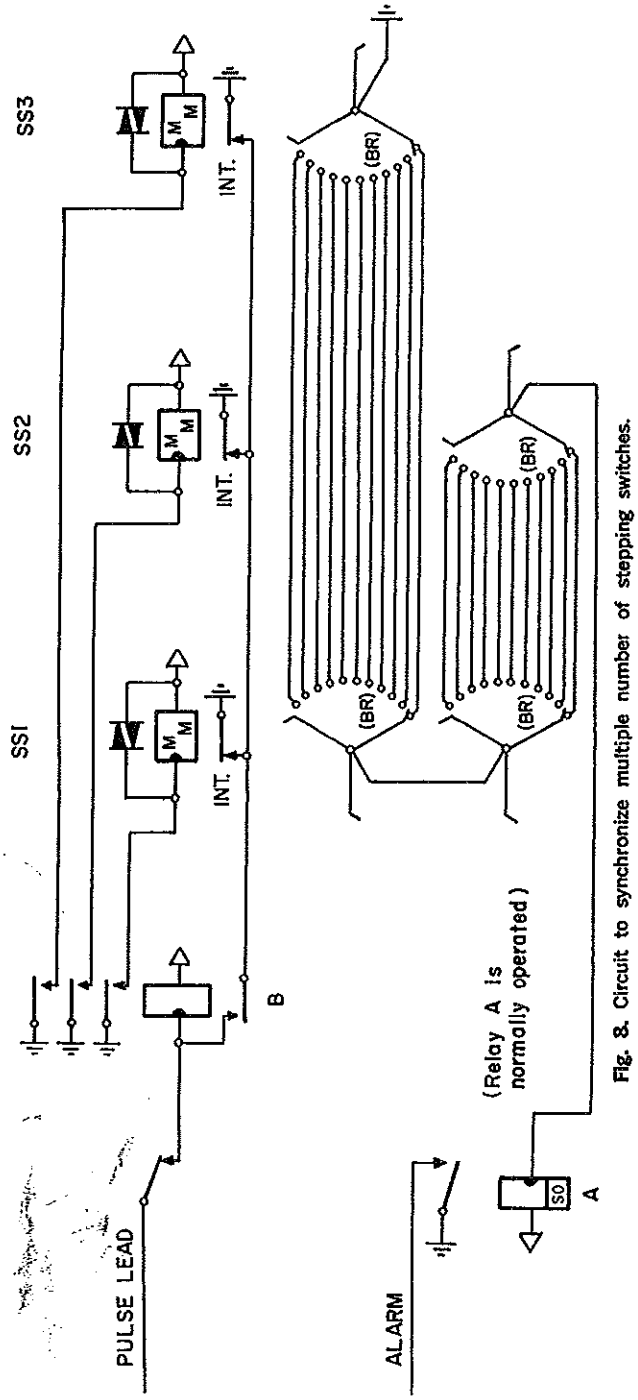


Fig. 8. Circuit to synchronize multiple number of stepping switches.

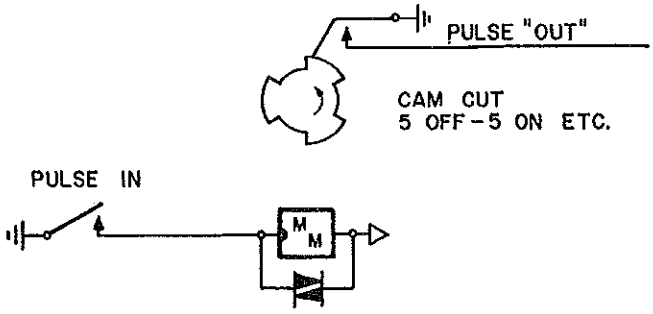


Fig. 9. 30-point OCS Relay used as a 5-to-1 divider.

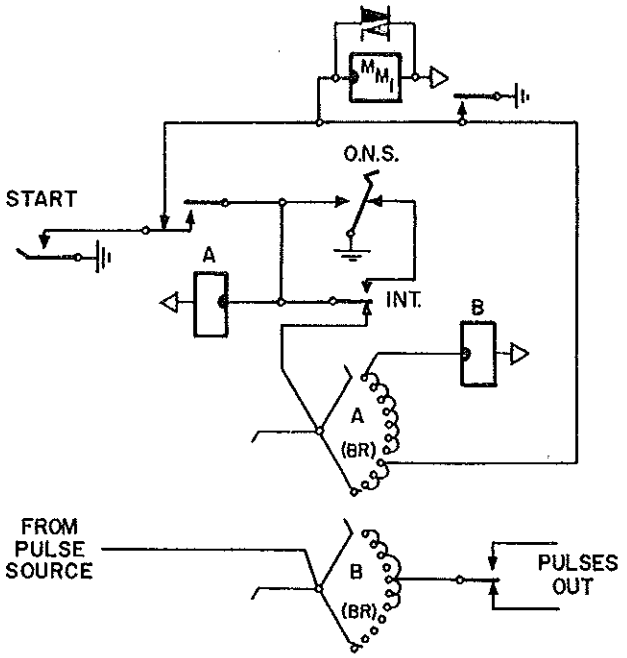


Fig. 10. Code sender or pulse multiplier. (Characteristics of "B" control the pulse frequency and % make.)

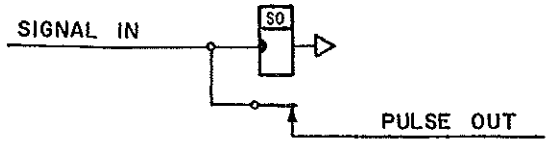


Fig. 11. Pulse shortener.

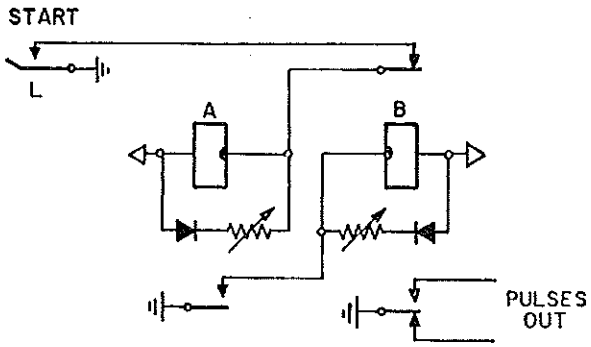


Fig. 12. Simple variable-pulse generator.

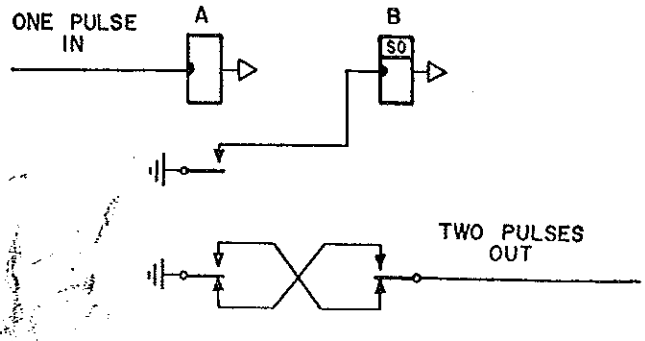


Fig. 13. Pulse doubler. (Relay "B" is slow to operate and slow to release.)

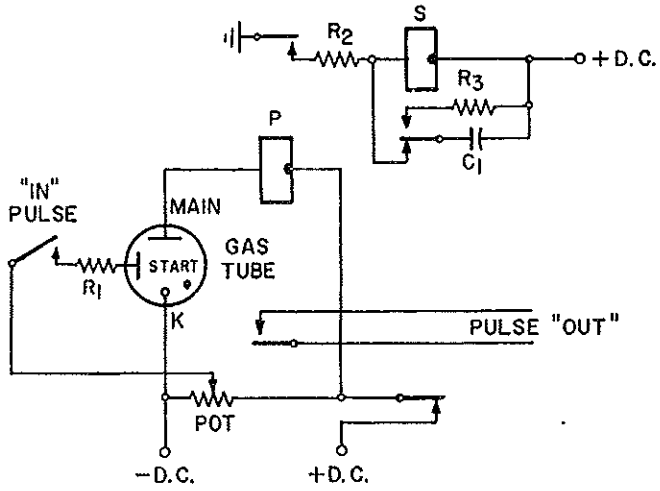


Fig. 14. Gas-tube pulse stretcher

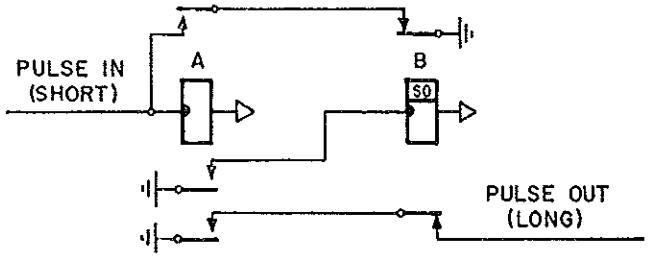


Fig. 15. Pulse stretcher (2-relay).

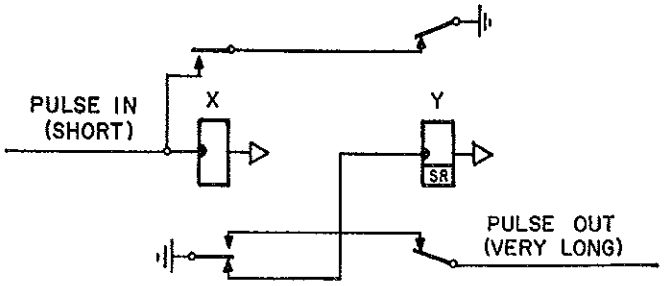


Fig. 16. Pulse stretcher (2-relay).

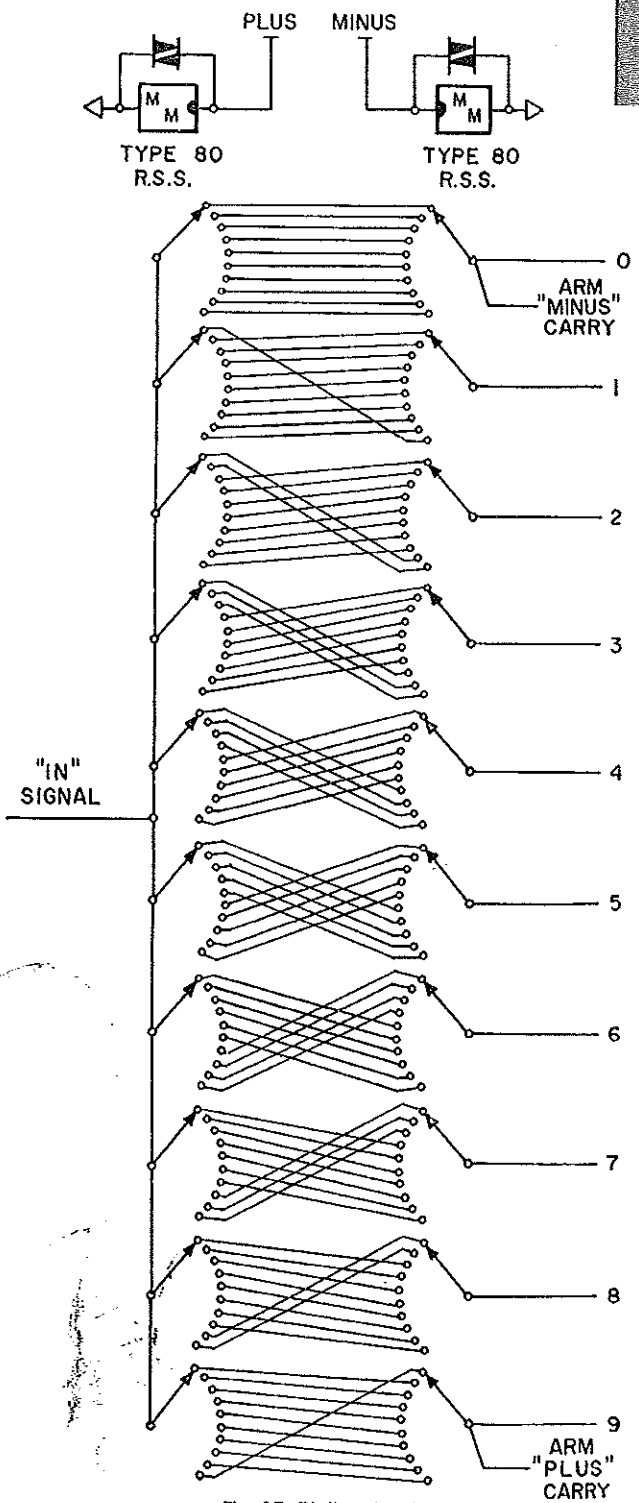


Fig. 17. Bi-directional decade.

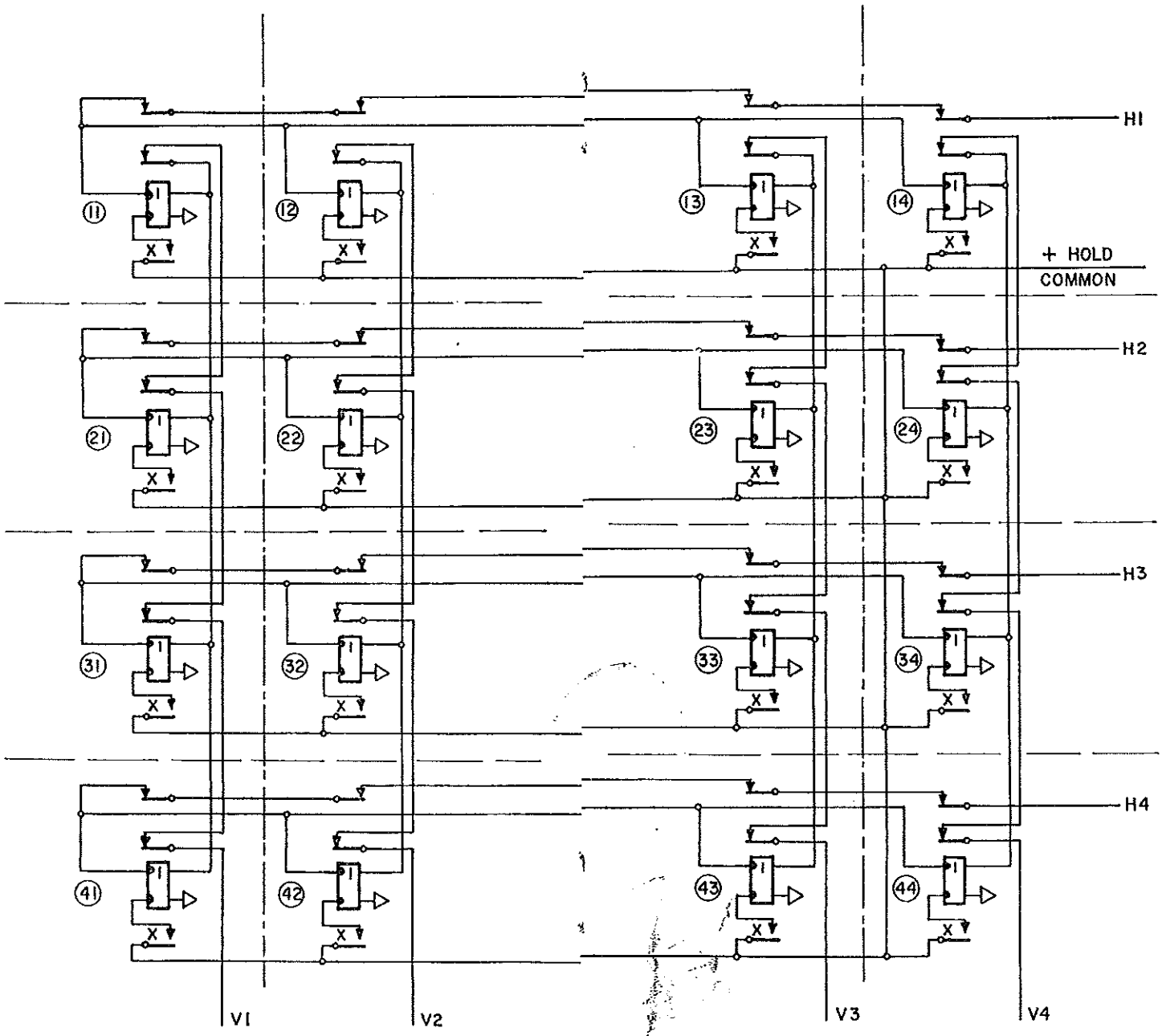


Fig. 18. Relay matrix, 4 x 4 full cross program.

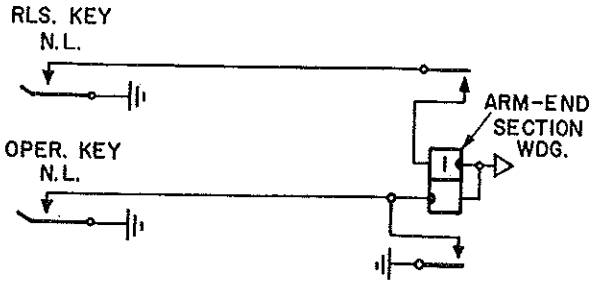


Fig. 19. Usual method of operating, holding and releasing double-wound relay.

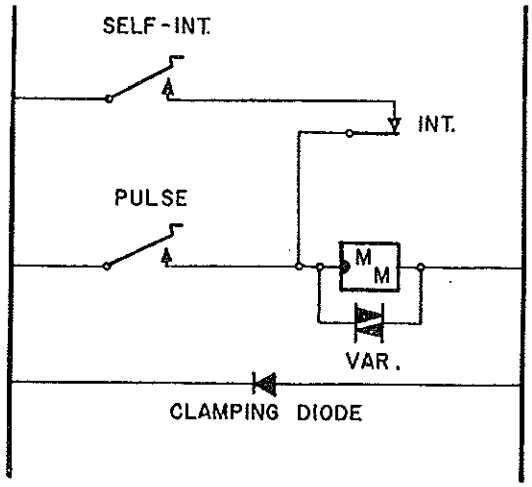
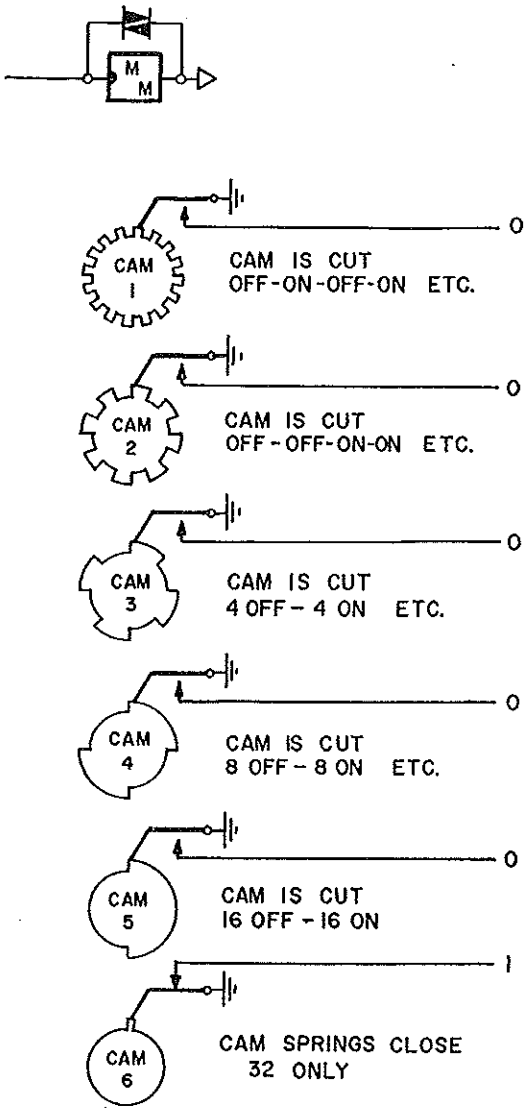


Fig. 20. Rotary stepping switch circuit with diode for reduction of electrical noise.



NOTE: This is a schematic presentation for simplicity. Cams may be rearranged for proper load distribution.

Fig. 21. AE's 32-point OCS Relay used as a binary readout. (Shown in position 32).

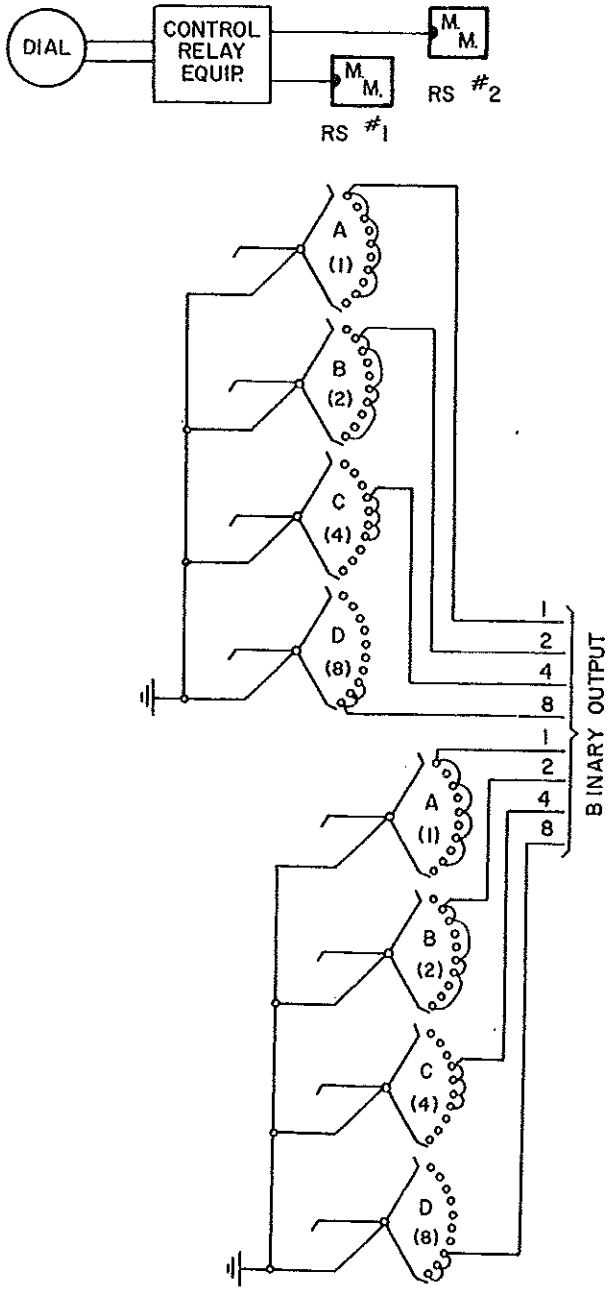


Fig. 22. Decimal-to-binary conversion.

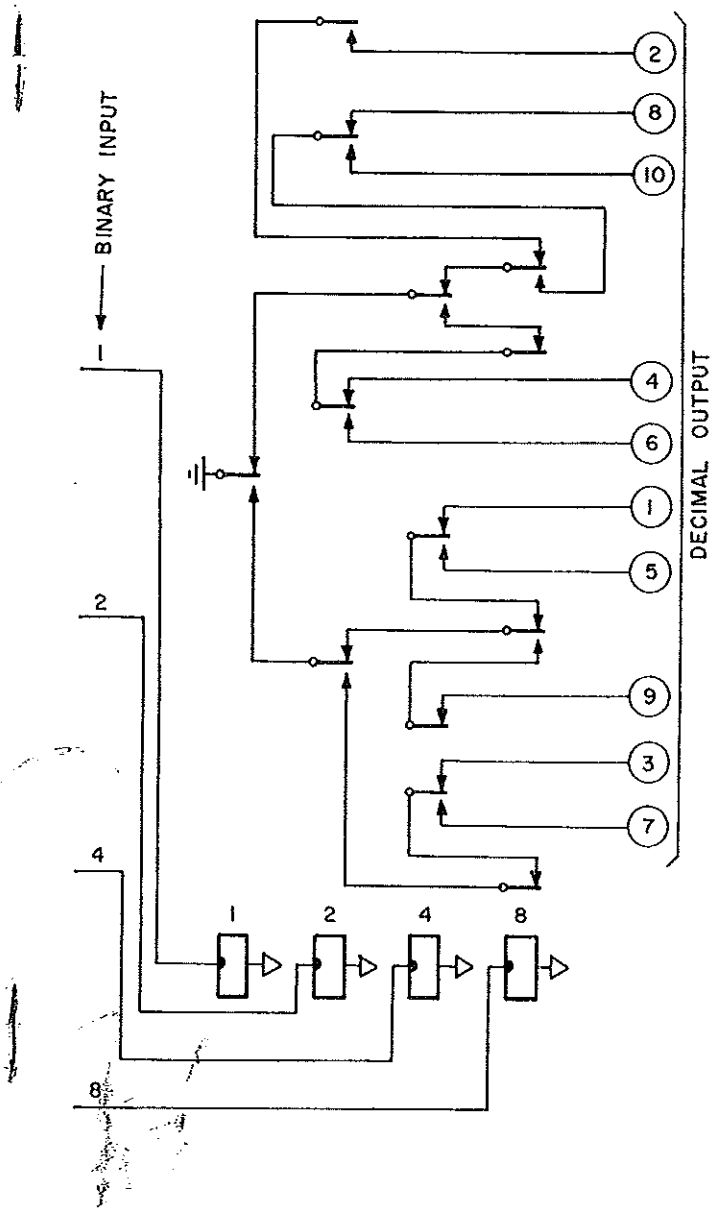


Fig. 23. Binary-to-decimal conversion.

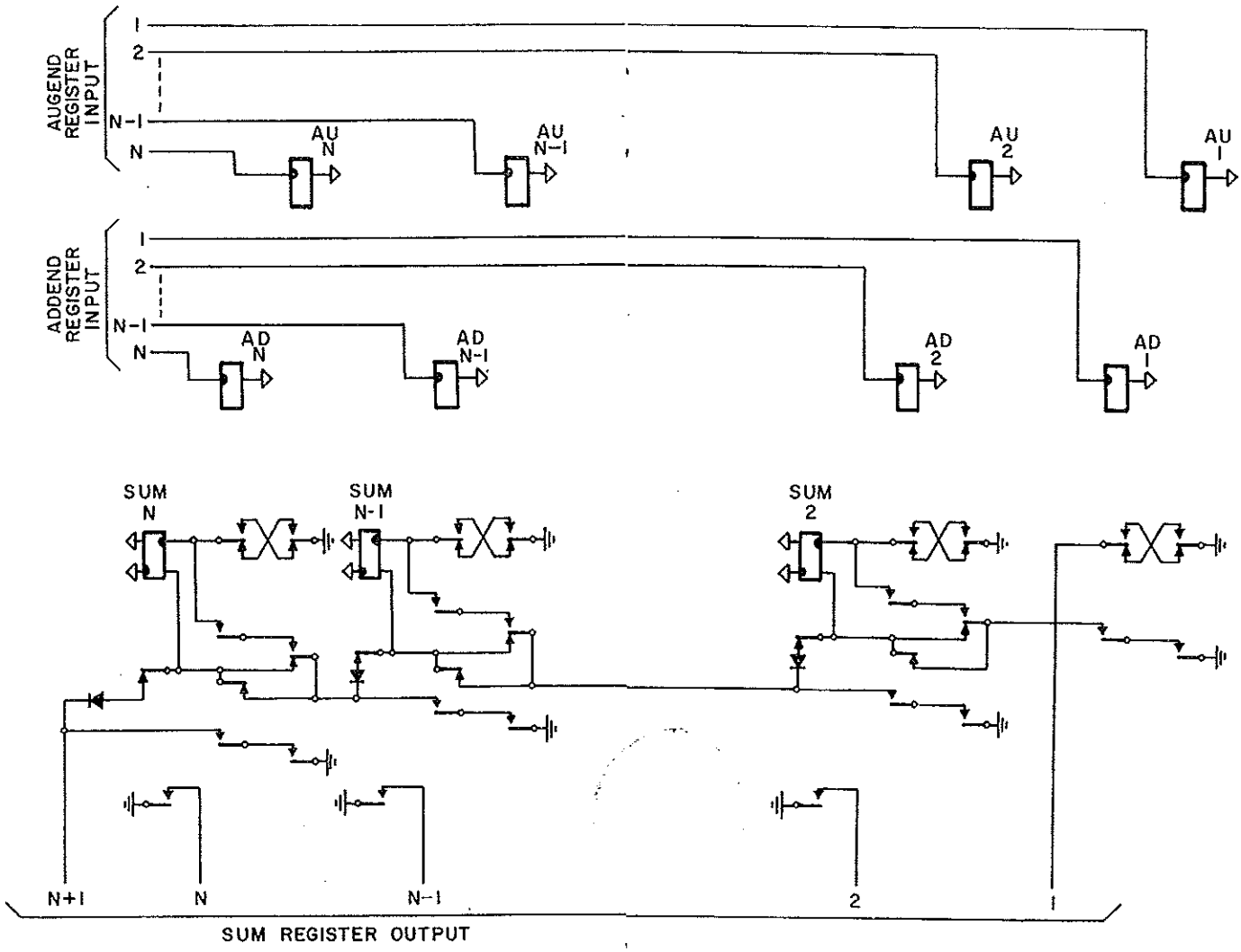


Fig. 24. Addition of numbers in binary form.

"IN" CARRY	AUGEND	ADDEND	SUM	"OUT" CARRY
NO	0	0	0	NO
NO	1	0	1	NO
NO	0	1	1	NO
NO	1	1	(1) 0	YES
YES	0	0	1	NO
YES	1	0	(1) 0	YES
YES	0	1	(1) 0	YES
YES	1	1	(1) 1	YES

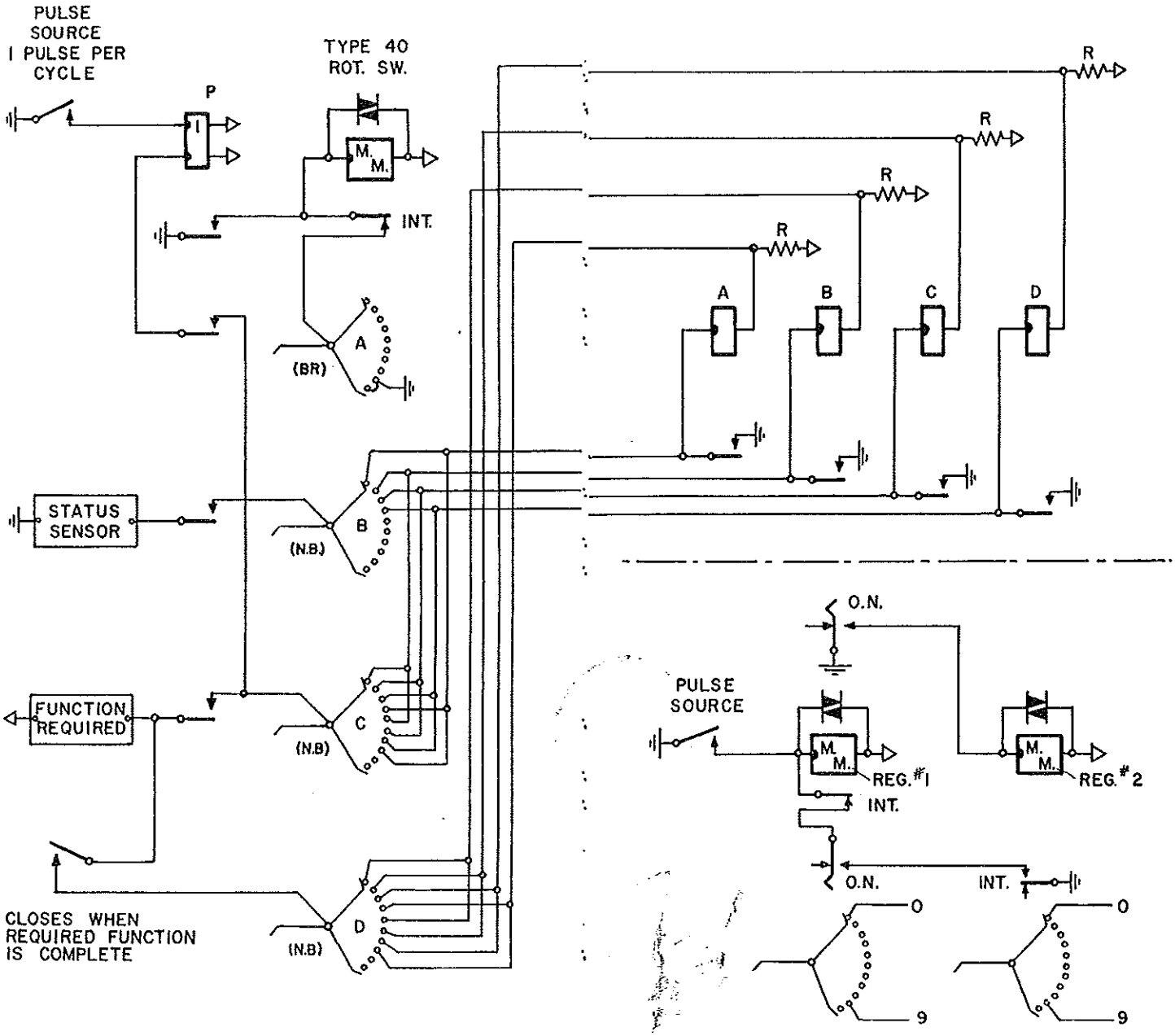


Fig. 25. Four-bit shift register using AE's Codel Relay.

Fig. 26. "Carry" to second register.

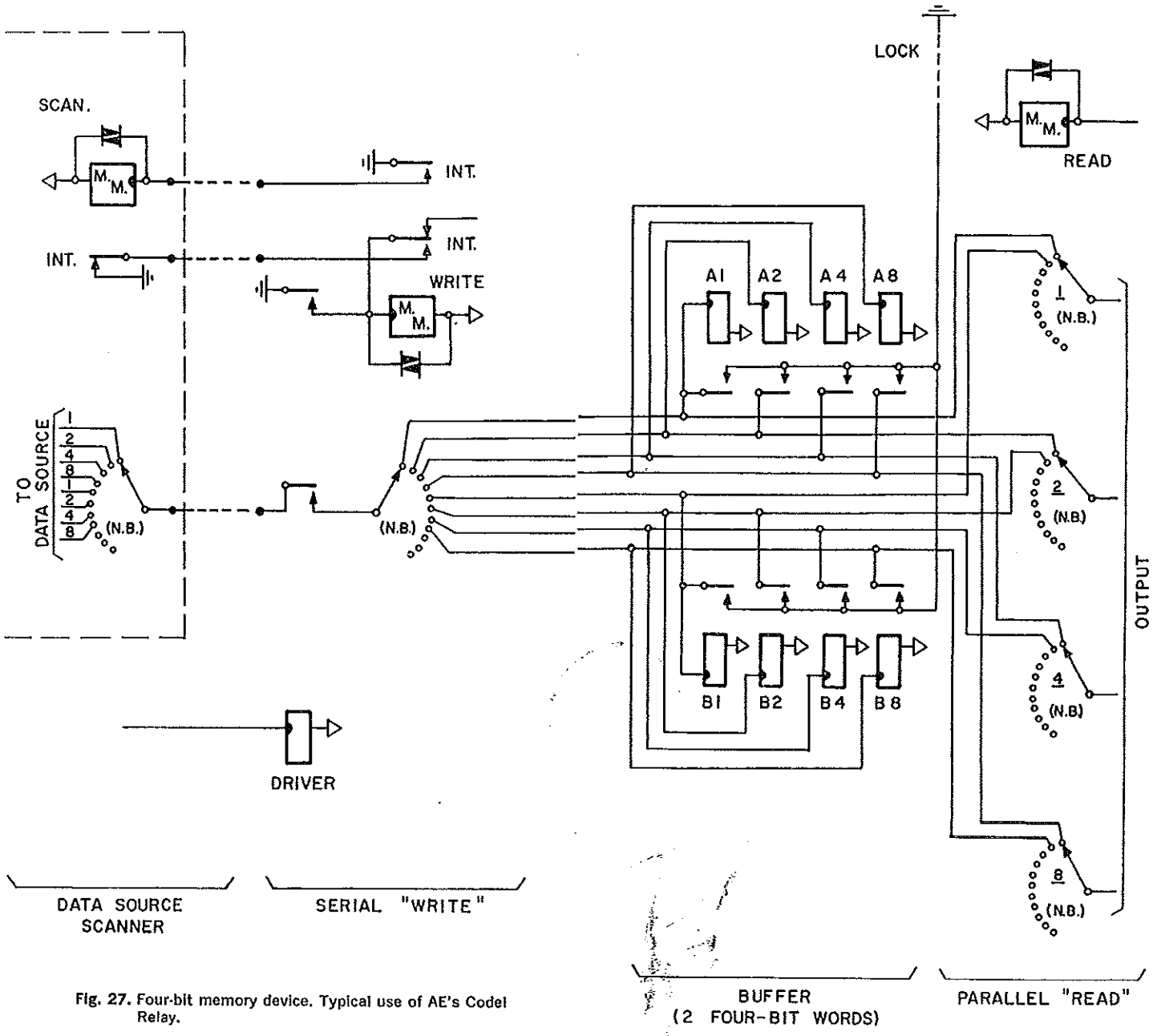
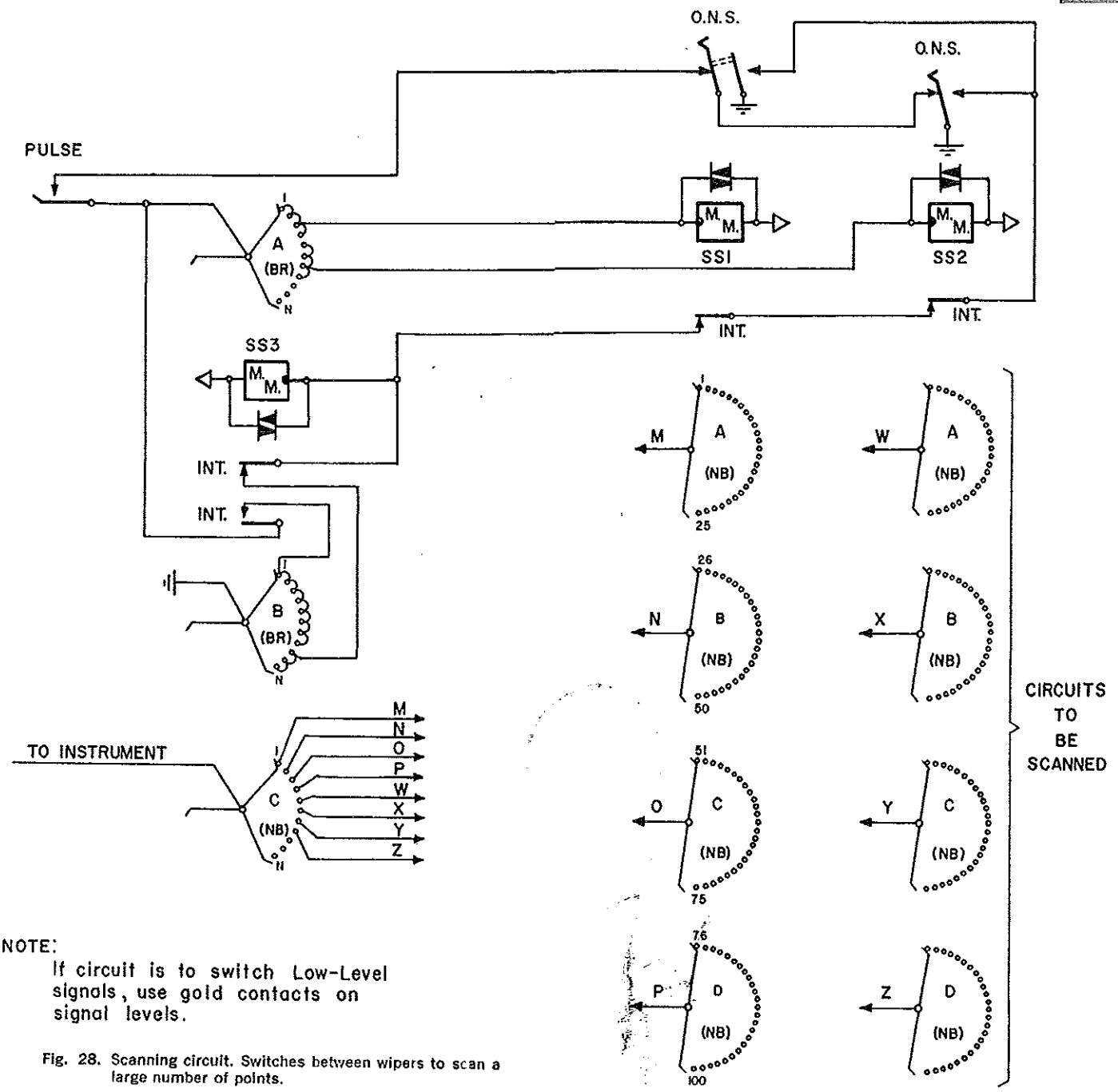
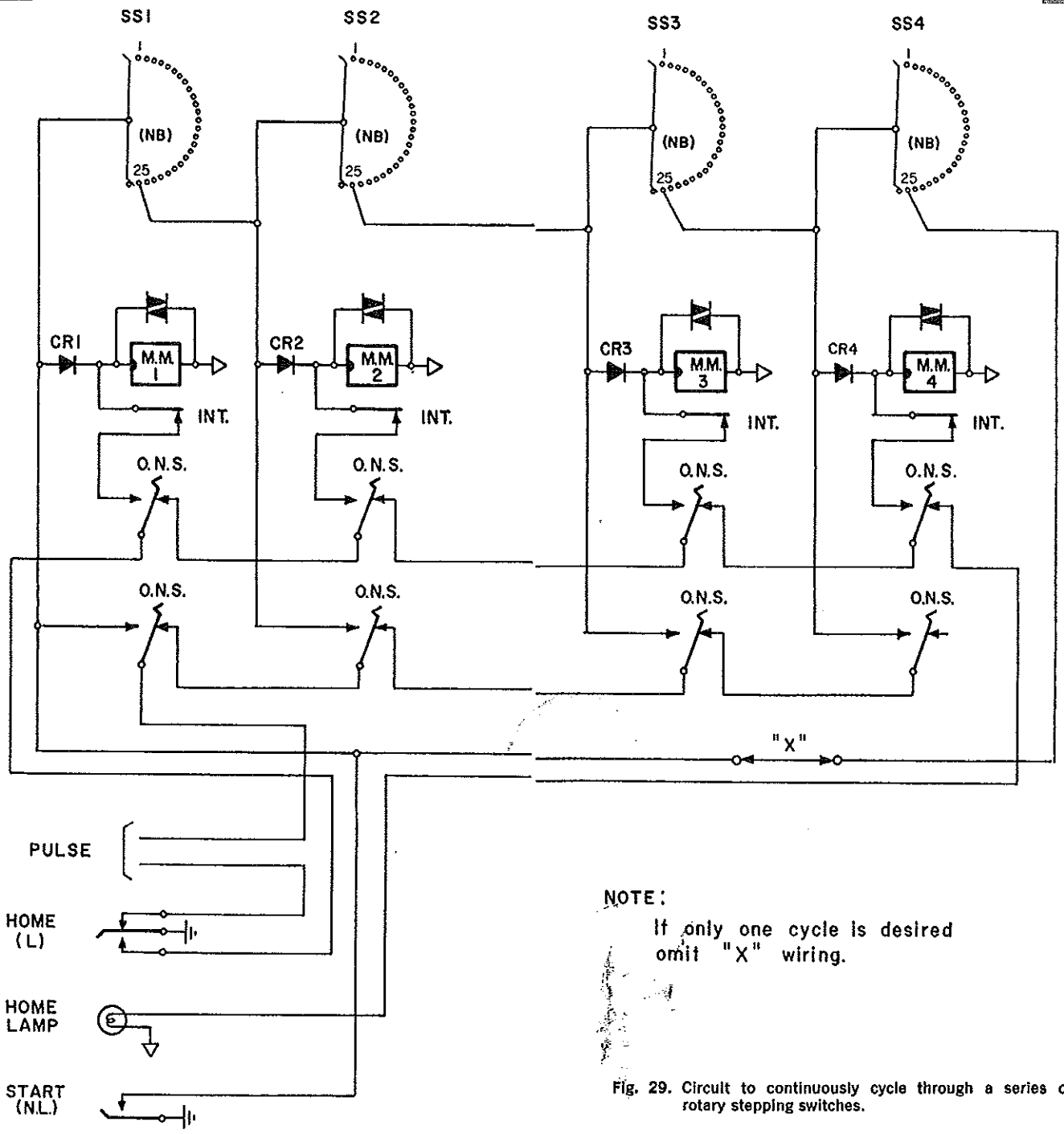


Fig. 27. Four-bit memory device. Typical use of AE's Codel Relay.



NOTE:
If circuit is to switch Low-Level signals, use gold contacts on signal levels.

Fig. 28. Scanning circuit. Switches between wipers to scan a large number of points.



NOTE:

If only one cycle is desired omit "X" wiring.

Fig. 29. Circuit to continuously cycle through a series of rotary stepping switches.

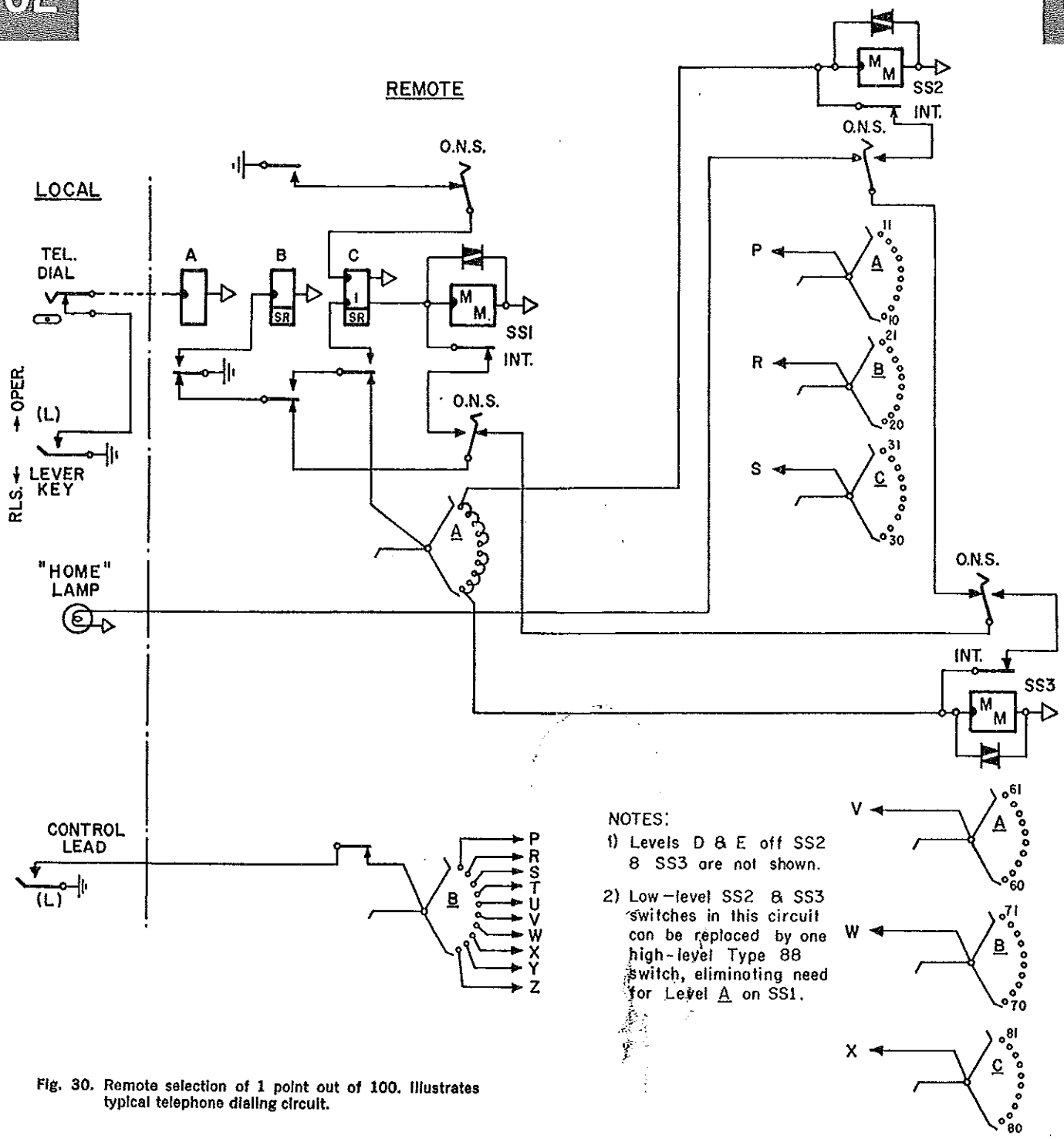


Fig. 30. Remote selection of 1 point out of 100. Illustrates typical telephone dialing circuit.

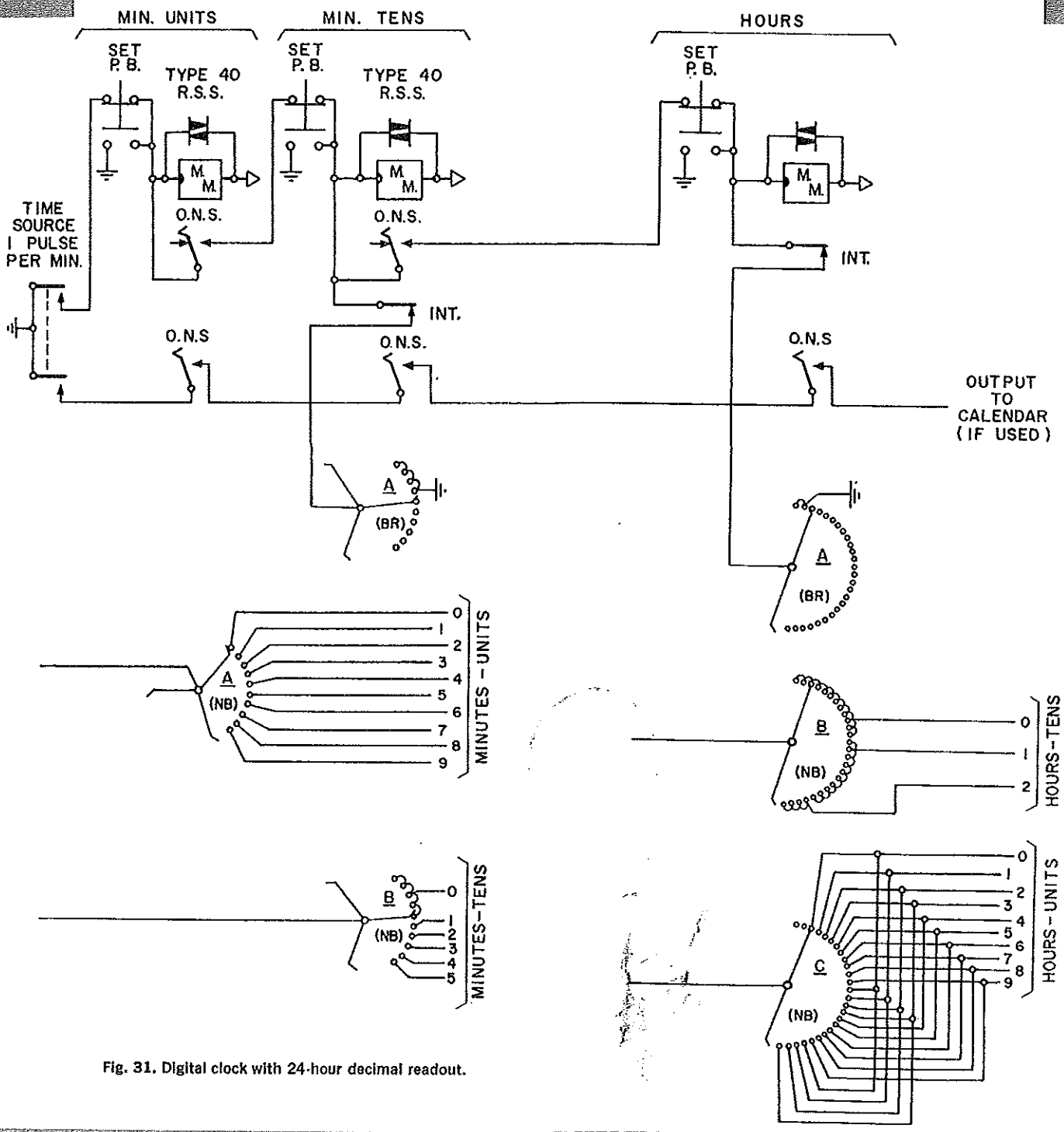


Fig. 31. Digital clock with 24-hour decimal readout.

DIGITAL CALENDAR

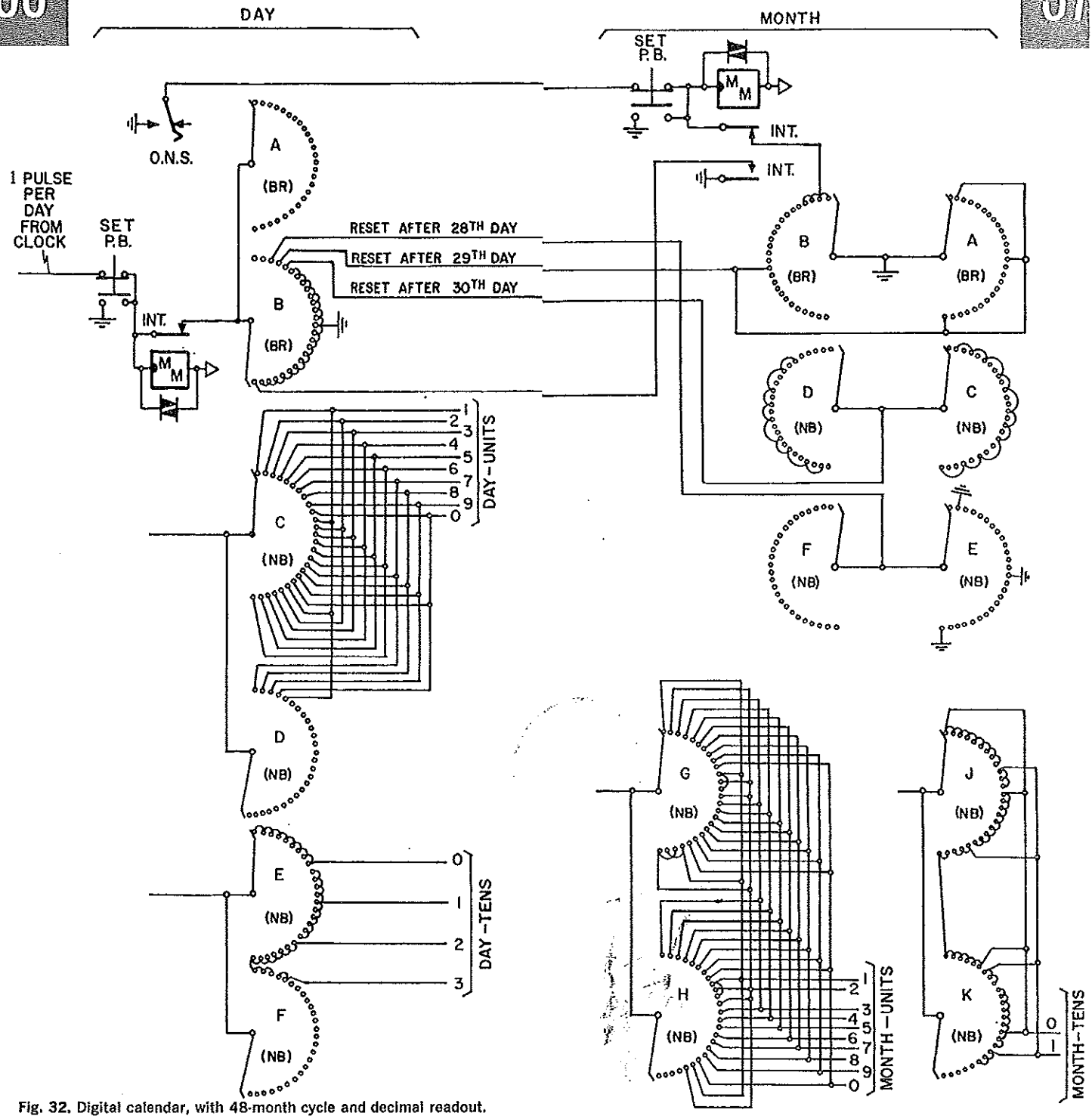


Fig. 32. Digital calendar, with 48-month cycle and decimal readout.

CIRCUIT TRAPS. DON'T USE!

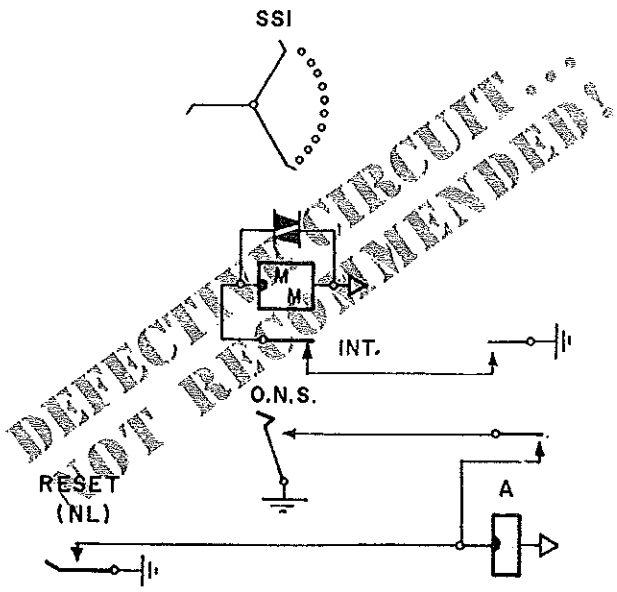


Fig. 33. Trap #1. Stopping a self-interrupted rotary stepping switch by releasing a relay.

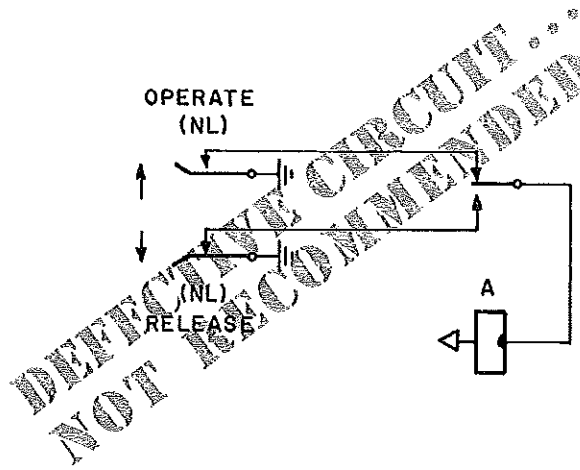


Fig. 35. Trap #3. Switching a relay's coil circuit with a Form C contract.

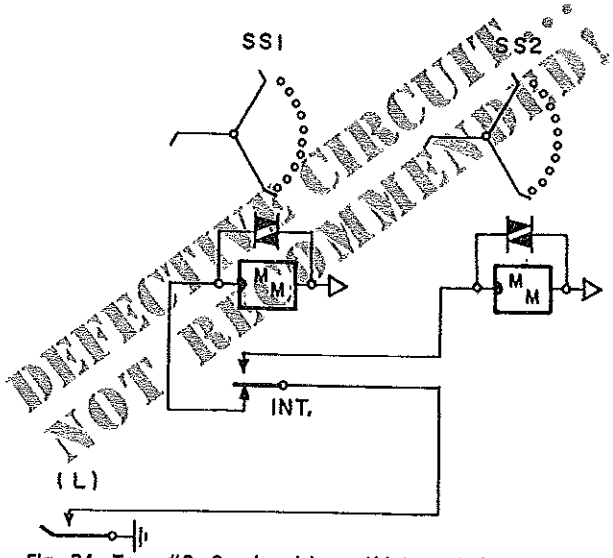


Fig. 34. Trap #2. Synchronizing self-interrupted rotary stepping switches.

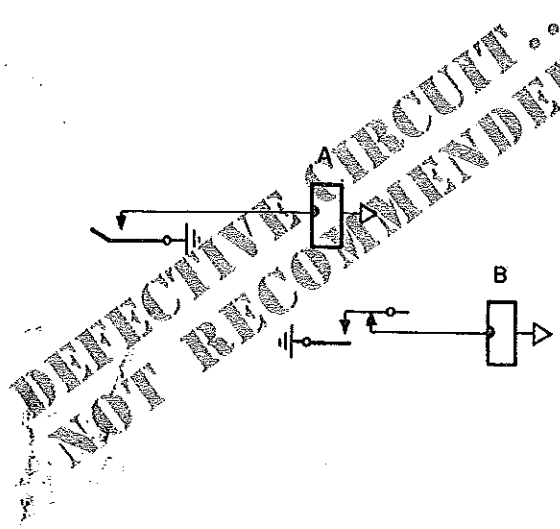


Fig. 36. Trap #4. Operating a relay with a pulse from a Form D.

CIRCUIT TRAPS. DON'T USE!

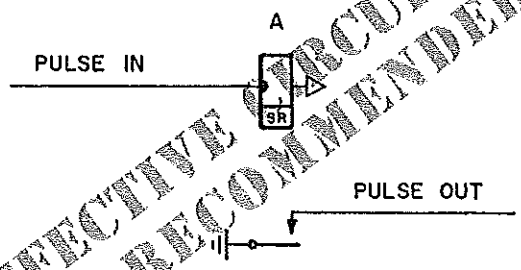


Fig. 37. Trap #5. Pulse-stretching with one relay.

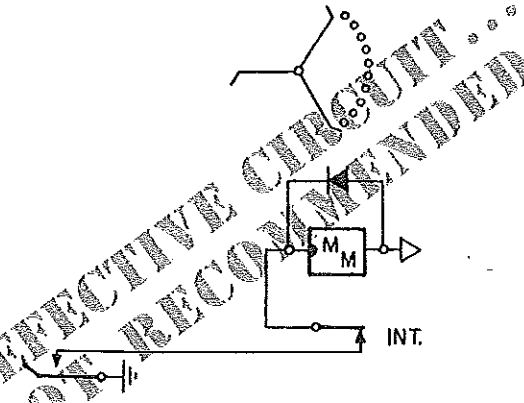
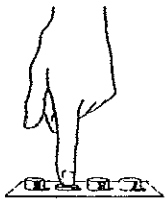


Fig. 38. Trap #6. Use of a diode as a spark-suppressor on a self interrupted rotary stepping switch.



Automatic Electric, pioneer in the use of relays and switches for industry, has the experience, manufacturing facilities, and research staff to solve your knottiest control problem. We specialize in the hermetic sealing of relays and switches, as well as in the design, circuitry and assembly of industrial control "packages" and systems. Our representative and facilities are at your command.

Salesmen

ATLANTA, GA.
BURLINGAME, CALIF. (San Francisco Suburb)
CLEVELAND, OHIO
DALLAS, TEXAS
DAYTON, OHIO
DETROIT, MICH.
HAVERFORD, PA. (Philadelphia Suburb)
KANSAS CITY, MO.
LEXINGTON, MASS.
*LOS ANGELES, CALIF.
MINNEAPOLIS, MINN.
*NEW YORK, N. Y.
*NORTHLAKE, ILL. (Chicago Suburb)
ROCHESTER, N. Y.
ST. LOUIS, MO.
SPRINGFIELD, VA.

* District Office

Check the Yellow pages of your telephone directory under "Relays", to get in touch with our representative in your area. Address all Home Office inquiries to: Director, Control Equipment Sales.

AUTOMATIC ELECTRIC
SUBSIDIARY OF GENERAL TELEPHONE & ELECTRONICS GT&E

Distributors in U.S. and Possessions

AUTOMATIC ELECTRIC SALES CORPORATION
Northlake, Illinois • 562-7100
Chicago Telephone: EStebrook 9-4300

In Canada: Automatic Electric Sales (Canada) Ltd.,
185 Bartley Drive, Toronto 16, Ontario

Circular 1012-B 40M 3-65 Merit Printed in U.S.A.