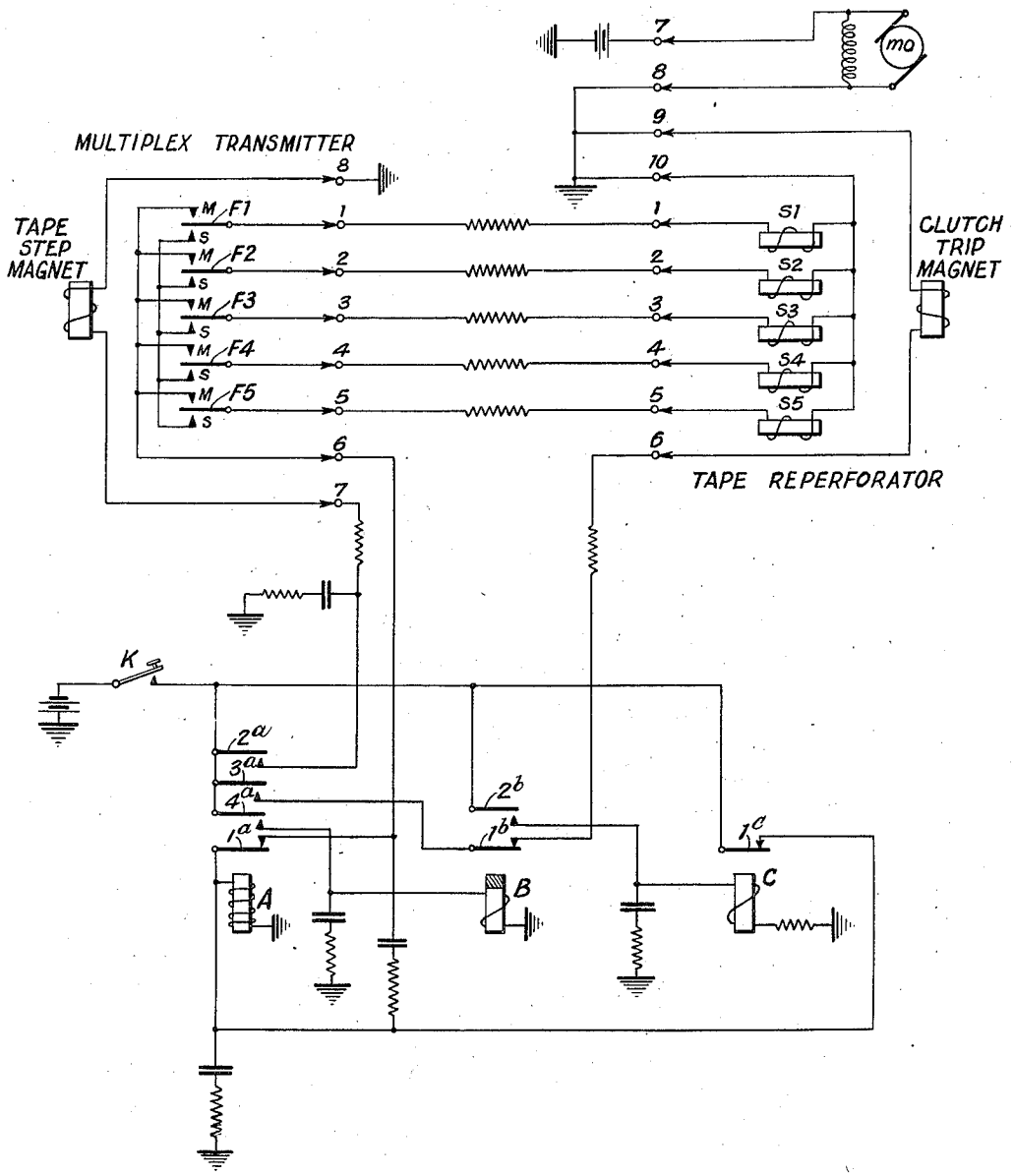
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PERFORATOR

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PERFORATOR

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This invention relates to improvements in mechanisms for controlling the operation of perforators or the like.

Among the objects of this invention is the provision of improved means for causing the proper cooperation of a sensing mechanism and a tape perforator, or the like, to insure the proper sequential operation of the various elements of these mechanisms.

Another object of the invention is to provide a controlling mechanism comprising a plurality of relays which automatically function to open and close the circuits to the various elements of the sensing mechanism and a tape perforator in the proper sequential order.

Other objects of the invention will appear from the following description taken in connection with the figure of the drawing, which shows a diagram of the circuit arrangement of a tape sensing mechanism and a tape reperforator.

The tape sensing mechanism may be of any well known construction including sensing pins or feelers which cooperate with perforations, electrical conducting deposits on the tape, or any equivalent records, to close circuits or to control the operation of circuit closing switches indicated diagrammatically in the figure and designated F1, F2, F3, F4 and F5. A tape sensing mechanism with which the circuit system disclosed may be employed is shown in the patent to Benjamin, No. 1,298,440, granted March 25, 1919. The tape reperforator may be of any well known construction, such as described in Bulletin No. 143, issued November, 1930 by the Teletype Corporation, Chicago, Illinois, and entitled "Teletype Printing Telegraph Systems", Description and Adjustments, Reperforator (Model 12), and in so far as this invention is concerned this mechanism may comprise means for depositing electrical conducting material on a tape or card or otherwise make a record of the information sensed. When the sensing pins or feelers in the embodiment disclosed find perforations in a tape fed over these feelers by a tape step magnet, the switches F1, F2, F3, F4 and F5 are moved against the marking contacts M in various combinations to prepare circuits over the coils of the punch selecting magnets S1, S2, S3, S4 and S5 in the tape reperforator. The drawing diagramatically illustrates parts of a well known form of multiplex transmitter and a well known form of reperforator.

When these selector magnets are energized they will control the movement of selector bars, (not shown), in various combinations to control the selection of punches, (not shown), which will be actuated to perforate a tape when a circuit is made across the clutch trip magnet which sets the reperforator in operation, the mechanism functioning to punch the tape as controlled by the magnets S1, S2, S3, S4 and S5, and then to feed the tape to present another portion of the tape to the punches. The reperforator may be driven by a motor diagrammatically indicated at *mo*.

The mechanism is set in operation by closing the key K which connects battery over the armature and break contact 1*c* of the relay C, and over the coil of the slow operating relay A, to ground, causing this relay to operate. Before this relay is operated, however, battery is extended over the armature and break contact 1*a* of relay A, over the various operated switches F1, F2, F3, F4 and F5 of the multiplex transmitter engaged with the marking contacts M, and over the coils of the corresponding punch selector magnets S1, S2, S3, S4 and S5, to ground, causing the selector magnets to operate and to select the corresponding punches for operation.

Immediately after the selection has been made, the relay A opens the circuit over said punch selector magnets, and at the same time closes circuits from battery across the key K as follows: a circuit over the armature and make contact 2*a* of relay A which operates the tape step magnet in the multiplex transmitter causing the tape to step forward to the next series of perforations; a circuit over the armature and make contact 3*a* of relay A, over the armature and break contact 1*b* of relay B and the coil of the clutch trip magnet of the tape reperforator which sets the tape reperforator in operation; and a circuit over the armature and make contact 4*a* of relay A and the coil of relay B which causes the slow-to-release relay B to operate and to open the circuit over the coil of the clutch trip magnet at its armature and break contact 1*b* and to close a circuit over the coil of the relay C at its armature and make contact 2*b*. The relay C operates and at its armature and break contact 1*c* opens the circuit over the relay A, causing this relay to deenergize, which at its armature and break contact 1*a* closes circuits over the operated switches F1, F2, F3, F4 and F5 and the coils of the selector magnets S1, S2, S3, S4 and S5, to ground.

The deenergization of the relay A also opens the circuits over the tape step magnet and the

clutch trip magnet at its armatures and make contacts 2*a* and 3*a*, and at its armature and make contact 4*a* it opens the circuit over the slow-to-release relay B, which upon release closes in part the circuit over the clutch trip magnet at its armature and break contact 1*b* and opens the circuit over the relay C at its armature and make contact 2*b* causing the relay C to deenergize, which closes the circuit over the relay A at its armature 1*a* to initiate another cycle of operation.

The result of a continued series of operating cycles as described is that there is produced by the reperforator a perforated tape which shall be a duplicate, as regards perforation combinations, of the perforated tape passing through the multiplex transmitter. The speed at which this duplicate tape is produced is controlled and held constant by the characteristics of the controlling relays, and may be so adjusted by properly specifying the characteristics of these relays as to operate the multiplex transmitter and reperforator at the maximum speeds permitted by the mechanical construction of these two units.

The condensers and resistors shown are for protection of the relay contacts against burning, or for limiting the currents in the various circuits.

While the invention has been described with reference to a particular embodiment involving particular circuits and combinations of relays operating as described, it is to be understood that the claims are to be construed to cover all embodiments which fall within the spirit of this invention, and that various other sensing and reproducing mechanisms may be controlled by the circuits and combinations of relays disclosed.

What I claim is:

1. The combination with a tape sensing mechanism and a reperforator for duplicating perforated tapes, of a system of relays for controlling the coordinated operation of said sensing mechanism and reperforator during a continued series of operating cycles, said system of relays comprising a first relay, a second relay and a third relay, each of said relays having an armature for controlling the operation of another of said relays and each relay being controlled by the armature of another of said relays, and relay control circuits interconnecting said relays and armatures for causing cyclic operation of the relays in the order named.

2. The combination with a tape sensing mechanism and a reperforator for duplicating perforated tapes, of a system of relays operable repeatedly and at uniform intervals under control of their own circuits for controlling the speed and coordinated operation of said sensing mechanism and reperforator during a continued series of cycles, said system of relays comprising a first relay, a second relay and a third relay, each of said relays having an armature for controlling the operation of another of said relays and each relay being controlled by the armature of another of said relays, and relay control circuits interconnecting said relays and armatures for causing cyclic operation of the relays in the order named.

3. The combination with a tape sensing mechanism including circuit closing devices controlled by perforations in the tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, and mechanism operable when set in operation to repeatedly and at uniform intervals to first close circuits over said tape feeding magnet and clutch magnet and then open said circuits, and subsequently complete circuits across said devices and said selecting magnets, said mechanism comprising a start relay, a time delay relay and a release relay periodically operable in the order named, said start relay initiating operation of said tape feeding magnet and said clutch magnet, said time delay relay causing deenergization of said clutch magnet, and said release relay causing deenergization of said start relay.

4. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, and a system of relays operable repeatedly and at uniform intervals under control of their own circuits to close circuits over said devices and said punch selecting magnets, said tape feeding magnet and said clutch magnet, said system of relays comprising a start relay, a time delay relay and a release relay, each of said relays having an armature for controlling the operation of another of said relays, said relay control circuits for the system of relays interconnecting said relays and armatures for causing operation of the relays in the order named.

5. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, and a chain of relays operable to first close circuits over said tape feeding and clutch magnets and then open said circuits, and subsequently complete circuits across said devices and said selector magnets, said chain of relays comprising a start relay, at least one time delay relay and a release relay, and relay control circuits interconnecting said relays to cause cyclic operation thereof in the order named.

6. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, circuits including said devices and said selecting magnets, a slow operating relay connected in parallel with said circuits and adapted to open said circuits after said selecting magnets have been energized, and to close circuits over the coils of said tape feeding and clutch magnets, and means for releasing said relay to initiate a second operation.

7. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, a slow operating relay in parallel with circuits made over an armature of said relay and said devices and the coils of said selecting magnets, circuits over the coils of said tape feeding and clutch magnets adapted to be closed by operation of said relay, and a slow release relay operated and released under control of said slow operating relay and operating to open the circuit over the coil of said clutch

magnet and to maintain it open for a predetermined interval of time after the release of said slow operating relay.

8. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, a slow operating relay in parallel with circuits made over an armature of said relay and said devices and the coils of said selecting magnets, circuits over the coils of said tape feeding and clutch magnets adapted to be closed by operation of said relay, a slow release relay operated and released under control of said slow operating relay and operating to open the circuit over the coil of said clutch magnet and to maintain it open for a predetermined interval of time after the release of said slow operating relay, and a quick operating relay operated under control of said slow release relay for opening and closing the circuit over said slow operating relay and said devices and selecting magnets.

9. The combination of a tape sensing mechanism including circuit closing devices controlled by perforations in a tape and a tape feeding magnet, of a perforating mechanism including punch selecting magnets and a clutch magnet for controlling the operation of said perforating mechanism, and a chain of three relays including a slow operating relay, a slow releasing relay and a quick operating relay, said slow operating relay opening circuits over said devices and selecting magnets and closing circuits over said tape feeding and clutch magnets and said slow-to-release relay, said slow-to-release relay opening the circuit over said clutch magnet and closing the circuit over said quick operating relay, said quick operating relay opening the circuit over said slow operating relay, which releases said slow-to-release relay which in turn releases said quick operating relay restoring the chain of relays to normal and initiating another operation.

10. The combination of a tape sensing mechanism involving circuit closing devices adapted to be controlled by perforations in a tape and a tape stepping magnet, a reperforator including punch selecting magnets and a clutch trip magnet operable to release mechanism for punching the tape in accordance with the selecting magnets operated and for feeding the tape, circuits adapted to be made over said circuit closing devices of the sensing mechanism and the coils of said punch selecting magnets, a slow operating relay operating to close circuits over said tape stepping magnet and said clutch trip magnet and to open the circuits over said circuit closing devices and over the coils of said punch selecting magnets, a second relay energized under control of said first relay and operable to open the circuit over the clutch trip magnet and to close another circuit, and a relay in said last mentioned circuit adapted upon operation to open the circuit to said first relay, this relay thereupon functioning to open the circuits over the coils of the tape stepping magnet, the clutch trip magnet and the second mentioned relay and to again close the circuit over the switches in the sensing mechanism and the coils of the punch selecting magnets, said second mentioned relay upon deenergization causing the release of said third relay, and said third relay upon releasing causing the reoperation of said first relay to start another cycle of operation as described.

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