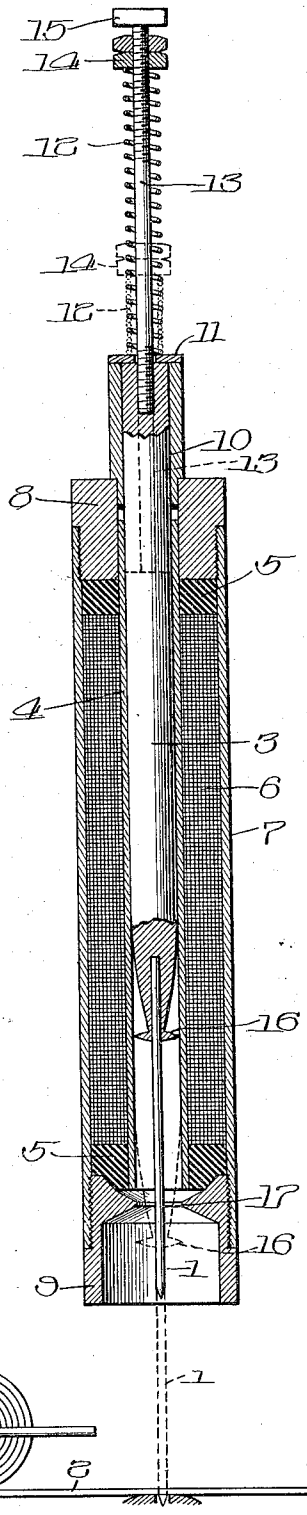
C. R. MOORE.

RECORDING INSTRUMENT.

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1,155,501.

Patented Oct. 5, 1915.



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RECORDING INSTRUMENT.

1,155,501. Specification of Letters Patent. Patented Oct. 5, 1915.

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To all whom it may concern:

Be it known that I, CHARLES R. MOORE, citizen of the United States, residing at La Fayette, in the county of Tippecanoe and State of Indiana, have invented a certain new and useful Improvement in Recording Instruments, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to recording instruments employing electro-magnetically operated recording elements that operate upon suitable record receivers such as paper tape.

The invention is of particular service in connection with those recording instruments in which the recording elements are in the form of paper perforating punches to make perforated records, though the invention is not to be limited to the nature of the recording elements employed.

In practising my invention the recording element is, when normally idle, held in retracted position by means of a spring or other agency, from which position it is moved by an operating electro-magnet, when energized. The magnet is so inter-related with the recording element that the direct influence of the magnet upon the recording element becomes insufficient to move the same shortly before the recording element reaches the limit of its recording movement, continuation of such movement then being due to inertia of the parts moved by the magnet. Direct influence of the magnet upon the recording element is restored during the portion of the recording movement due to inertia to aid in quickly returning the recording element to the position of equilibrium in which the forces of magnet and spring balance each other and in which position the recording element may stay if the circuit of the magnet remains closed and from which position the recording element is withdrawn to its normal idle position, when such circuit is opened, by means of the spring. Thus the withdrawal of the recording element from its operating position is not dependent upon the demagnetization of the operating magnet and may be partially effected, if desired, while the magnet remains energized, thereafter to be completely effected when the magnet is deënergized, all as may be predetermined or as may be desired according to the purpose the instrument is to fill.

I will explain my invention more fully by reference to the accompanying drawing showing the preferred embodiment thereof mainly in sectional elevation.

The movable recording element 1 is shown as being in the form of a steel punch adapted, in its reciprocating movements, to form punch holes in a paper or sheet tape 2 fed beneath the same by any suitable agency. The punch is co-axial with and has its upper end soldered within the cylindric armature or core 3 of an electro-magnet which is preferably in the form of a solenoid. The element 3, which is of soft iron, is reciprocable within the brass or other non-magnetic sleeve 4 which is employed to direct the travel of the core 3 and the punch carried thereby.

Winding spool heads 5 of insulating material are mounted upon the ends of the tubular sleeve 4 and define the length of the winding space of an energizing winding 6, the diameter of this winding space being determined by a soft iron tubular shell or sleeve 7. The sleeve 7 is provided with soft iron heads 8 and 9 that are screwed into its bore and serve to establish flux or magnetic circuit paths for the soft iron elements 3 and 7. A spring abutment is carried by the upper head 8, this abutment including a tubular brass or other non-magnetic sleeve 10, whose bore is also in guiding relation to the reciprocable core 3, and a washer 11 resting upon sleeve 10. The lower end of a coiled spring 12 rests upon the abutment washer 11, and the upper end of this spring operates upon the core 3 through the intermediation of a brass rod 13 soldered at its lower end into the upper end of core 3 and carrying spring tension adjusting nuts 14 at its upper end and which nuts engage the upper end of the spring. When the core 3 is not magnetically attracted, the spring operates to place the movable member comprising the recording punch 1 and core 3 in a

normal idle position, the spring holding the rod 13 against the stop 15 to prevent vibration of said movable member. The core 3 is so positioned and constructed that the magnetic flux which ensues upon the closure of the circuit for the coil 6 will operate in conjunction with the opposing spring 12 to place the core 3 in a position in which the punch 1 will nearly but not fully reach the paper 2 and from which position continued movement of the punch in its recording movement is due to the inertia of the punch 1 and the weight supplied thereto by the core 3. That is a point is reached in the recording movement of the punch where the magnetic pull ceases to be directly effective in continuing the recording movement owing to the offsetting actions of spring and magnet, whereby the continued recording movement of the punch is due alone to the inertia of the moving parts. When this point of equilibrium, in the downward movement of the punch, has been passed, the portion of the recording movement directly due to inertia is quickly and progressively increasingly opposed by the progressively increasing compression of the spring 12 and the progressively increased magnetic reversed pull of the magnet upon the movable member, whereby the punch (or other recording element) is quickly withdrawn, after it has done its work, at least to the position where the forces of the spring and magnetism balance and from which partially restored position the spring alone fully restores the punch to its idle position and then only when the magnet circuit is opened. Thus the spring or other mechanically acting restoring agency is not alone relied upon to effect the withdrawal of the punch instantly from immediate contact with the record sheet or tape. By the quick partial withdrawal of the punch from its work thus effected by the conjoint action of spring and magnetism, the paper is quickly cleared by the punch and may be kept in continuous motion, it being unnecessary to open the suitably controlled energizing circuit immediately to clear the punch from the paper.

In order to permit the inertia of the moving member 1—3 to have the greatest effect in completing the recording movement or stroke, the direct influence of the magnet upon the moving member should initially be removed as much as possible without impairing the function of the magnet in the part it later takes in restoring the moving member. To this end a part of the iron is removed above the portion 16 on the armature 3 and from both sides of the portion 17 of the head piece 9, the parts 16 and 17 being substantially in the same plane when magnet and spring balance each other on the recording movement. The portion 16 is thus in the form of a disk or button presenting a thin edge to the thin edge of ledge 17, when the spring and magnet balance. The lower end of the plunger core 3 is downwardly conically tapered to its place of connection with the button 16 so that as the button passes downwardly past the ledge the proximity of the core 3 to the ledge progressively increases, whereby the magnet is able progressively to increase its opposition to the downward movement of the movable member, the spring coöperating with the magnet in this function and in the function of restoring the movable member to its position of equilibrium with the parts 16 and 17 in juxtaposition, all under the assumption that the magnet remains energized. The magnet may of course be deënergized as soon as inertia of the movable member becomes effective to complete the recording movement or stroke, the spring 12 being free to restore the movable member to its normal idle position whenever the magnet is deënergized.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of the invention, but

Having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. A recording instrument including a recording element supplied with mechanically operating means for placing it in a normally idle position; an electro-magnet acting in opposition to said means and serving partially directly to effect recording movement of said recording element which is supplied with sufficient weight to enable it to complete its recording movement by inertia, said recording element remaining within the range of influence of the magnet substantially throughout the recording movement, the magnet opposing such inertia and exerting withdrawing action upon the recording element; and a record receiver operated upon by the recording element and located without the reach of the recording element as it is moved by the magnet and within reach of the recording element when its movement is completed by inertia.

2. A recording instrument including a recording element; an electro-magnet serving partially directly to effect recording movement of said recording element which is supplied with sufficient weight to enable it to complete its recording movement by inertia, said recording element remaining within the range of influence of the magnet substantially throughout the recording movement, the magnet opposing such inertia and exerting withdrawing action upon the recording

element; and a record receiver operated upon by the recording element and located without the reach of the recording element as it is moved by the magnet and within reach of the recording element when its movement is completed by inertia.

In witness whereof, I hereunto subscribe my name this 17th day of May A. D. 1913.

CHARLES R. MOORE.

Witnesses:

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T. M. ANDREW.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."