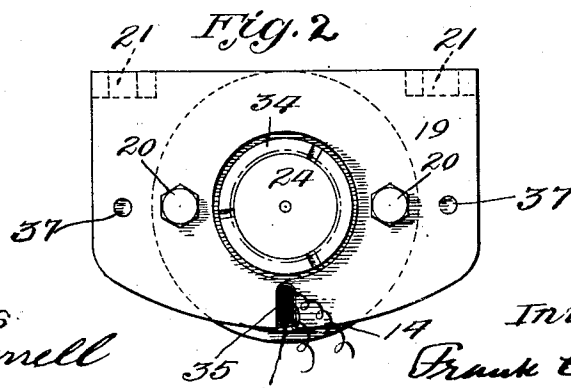
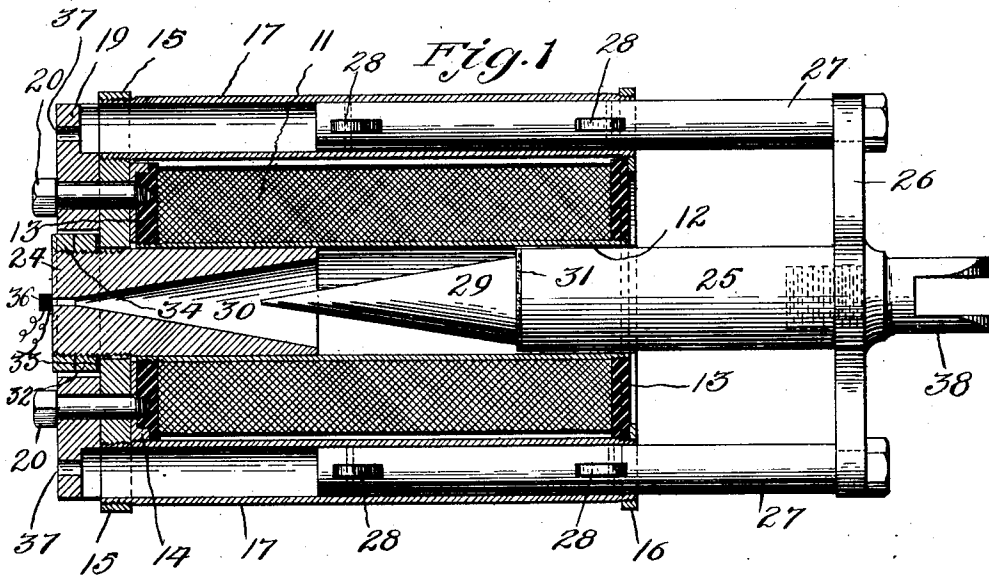


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SOLENOID FOR DRIVING ADDING MACHINES.  
APPLICATION FILED OCT. 2, 1913.

1,226,697.

Patented May 22, 1917.  
2 SHEETS—SHEET 1.



Witnesses  
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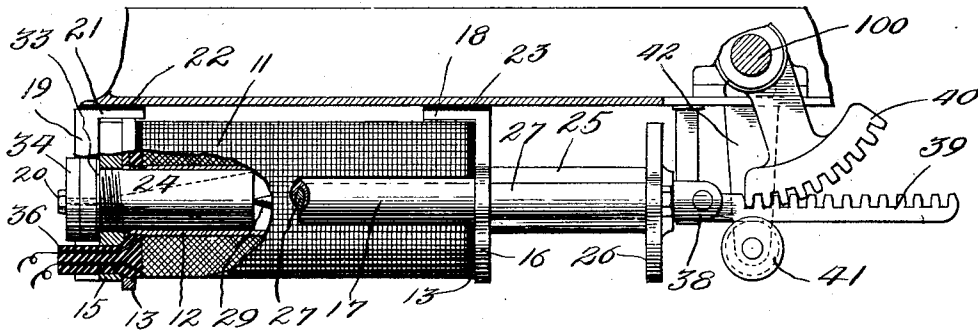
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*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

FRANK C. RINSCHÉ, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

## SOLENOID FOR DRIVING ADDING-MACHINES.

1,226,697.

Specification of Letters Patent.

Patented May 22, 1917.

Application filed October 2, 1913. Serial No. 792,941.

*To all whom it may concern:*

Be it known that I, FRANK C. RINSCHÉ, a citizen of the United States, residing at Detroit, county of Wayne, and State of Michigan, have invented certain new and useful Improvements in Solenoids for Driving Adding-Machines, of which the following is a specification.

The object of my invention is to produce a solenoid which is particularly well adapted for use in connection with an adding machine although it is also useful in other connections in which similar characteristics are desired. In an adding machine it is desirable that the driving mechanism operate quickly and with sufficient power for the purpose of fully operating all of the parts of the machine and at the same time the force of the motor should be applied substantially evenly throughout the stroke or in any event it should not materially increase toward the end of the stroke as in that event the operation would be accompanied by an undesirable shock at the end of each stroke. It is further desirable that the noise due to the operation of the machine be minimized to as great an extent as possible. The solenoid described herein fulfills these requirements of the art in a marked degree.

In the accompanying drawings I have shown and in the following specification described a preferred embodiment of my invention, but it is to be understood that the specific disclosure is for the purpose of exemplification only, and that the scope of the invention is set forth in the following claims.

In the drawing Figure 1 is a central section partly in elevation of the preferred form of my invention; Fig. 2 an end elevation thereof; and Fig. 3 a side elevation partly in section showing the application of the invention to an adding machine. The solenoid comprises a coil 11 of suitable character wound upon a hollow spool or sleeve 12 and supported at its ends by insulating end disks 13, 13. As shown in Fig. 1 the left-hand insulating disk is protected by a cap piece 14 and the whole coil construction is braced by a frame comprising a pair of end plates 15, 16 of magnetic material which are connected by hollow tubular posts 17 tapped into the same on diametrically opposite sides of the coil. The

plate 16 is formed with an ear 18 for connecting it to the frame of the machine and thereby supporting one end of the solenoid; the other end of the solenoid is supported by a separate bracket plate 19 which is bolted through plate 15 to the insulating disk upon the magnet coil by bolts 20, 20. Lugs 21, 21 are formed upon the bracket plate for the purpose of securing it to the base of the machine, it being understood that insulation 22, 23, is interposed between the lugs 21 and 18 and the machine and any suitable securing means insulated from the lugs such as screws employed for attaching the device to the machine base. The plate 13 and the bracket plate 19 are cut away or bolted concentric with the spool of the solenoid coil, the opening in the former being of the same diameter as the bore of the spool but that in the latter being slightly larger for a purpose which will appear, and through these openings and the end of the spool is inserted a relatively stationary core 24 which forms a portion of the magnetic field of the solenoid. The movable core 25 is supported upon a cross-head 26 connecting a pair of guide rods 27, 27, extending into the tubular posts 17 and movable longitudinally therein, anti-friction rollers 28, 28, being suitably mounted in the rods 27 to facilitate easy movement in the tubular guides. The inner end 29 of the movable solenoid core is tapered back a considerable distance from its point and the stationary core 24 is correspondingly bored out at 30 to receive the same, but a washer 31 of leather or similar resilient material mounted on a shoulder between the cylindrical and the tapered portions of the reciprocating core and adapted to impinge upon the edge of the stationary core prevents the members 29 and 30 coming into actual close contact in order that there may be no sticking. The stationary core 24 is loosely mounted in the solenoid so as to be capable of axial movement therein, and its inward motion to wit, that toward the reciprocating core is limited by an adjustable nut 32 screwed thereon by which the stroke of the reciprocating core can be adjusted, and a washer 33 which serves to cushion the blow of said nut upon the plate 15. A lock nut 34 prevents the stop nut becoming unscrewed.

The plate 15 and bracket plate 19 are per-

forated at 35 (see Fig. 2) for the reception of a projection 36 upon the insulating disk 13 which projection serves to insulate the terminals of the solenoid coil which extend therethrough, and said bracket plate is also provided with openings 37, 37 in registry with the tubular guides 17 to avoid air cushioning of the rods 27 therein. It will be understood that the stationary and movable cores as well as the cross-head 26, guide rods 27, tubular guides 17 and plate 15 are of magnetic material as iron or steel so that there is substantially a closed magnetic circuit at all times except for the gap between the tapered end of the movable core and the socket of the stationary core. Of course this gap is substantially closed when the movable core is in its innermost position and by reason of the long taper the gap is quite limited at all times thus securing a comparative even strong pull throughout the stroke even though the construction is such as to permit a very considerable movement of the movable core which I have found to be of decided advantage in the present structure. It will be apparent that when the coil is energized and the core 25 attracted it will in common with solenoid cores of the prior art acquire a fair degree of velocity, but by reason of the fact that the relatively stationary core is free to move under the impact of the reciprocating core and the washer 31 cushions the blow, the noise and shock of the operation is reduced to a minimum. The washer 33 deadens any noise which would be occasioned by the return of the relatively stationary core to its normal position after it has been displaced by the impact of the movable core.

The solenoid is secured beneath the base of the machine in horizontal position and the movable core 25 is provided with a bifurcated lug 38 between the members of which is pivoted a rack 39 movable horizontally and meshing with a rack sector 40 rigidly mounted upon the usual operating shaft 100 of the machine whereby the sole-

noid effects the oscillation of said shaft. Rack 39 is supported in contact with the rack segment by an anti-friction roller 41 mounted upon a bracket 42 depending from the machine base. Obviously whenever the solenoid coil is energized by the passage of a current it attracts its core, thereby operating the rack attached thereto and through it and the rack sector 27 the main shaft 100 of the machine and when the coil is disengaged the shaft and associated parts are returned to their original position by spring 180.

By the particular construction of solenoid having the long tapered movable core and corresponding stationary core and other features referred to above, I am enabled to obtain a long stroke of even pull throughout which is essential to the successful operation of an adding machine with a minimum of noise and shock.

I claim:

1. A solenoid comprising a coil, a movable core projecting into the said coil, a cross-head on said core, a pair of guide rods on opposite sides of the coil connected to said cross-head and tubular guides connected to the coil and receiving said rods.

2. A solenoid comprising a coil, a movable core extending through one end thereof, a cross-head on the core, a pair of guide rods connected to the cross-head on opposite sides of the coil and a pair of tubular guides connected to the coil on opposite sides thereof, and adapted to receive said rods.

3. A solenoid comprising a coil, plates 15, 16 arranged at opposite ends of said coil, tubular guides 17—17 extending between and connected to said plates, guide rods 27 entering said guides, and a cross-head 26 connected to said movable core and guide rods.

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Witnesses:

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