July 14, 1931. L. R. LE TANG 1,814,563

ELECTRICAL OPERATING MEANS

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Fig. 1.

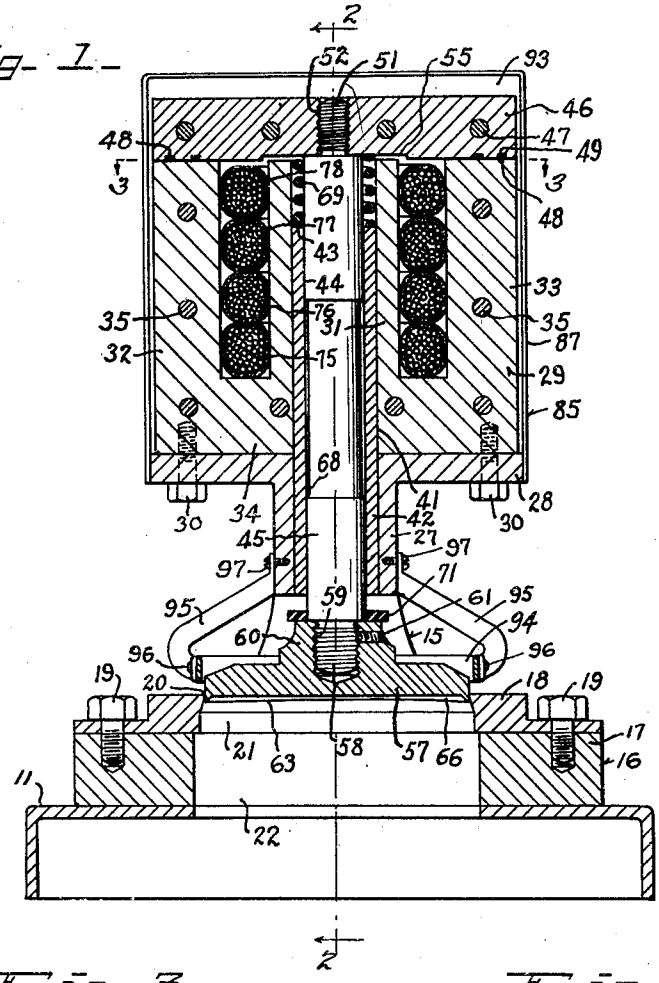


Fig. 3.

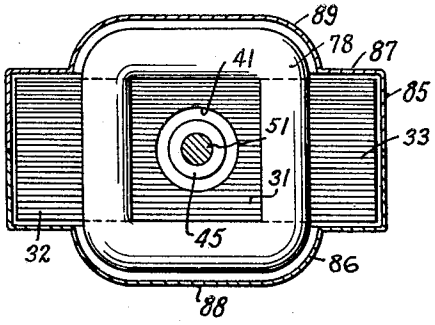
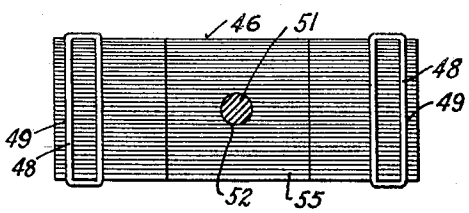


Fig. 4.



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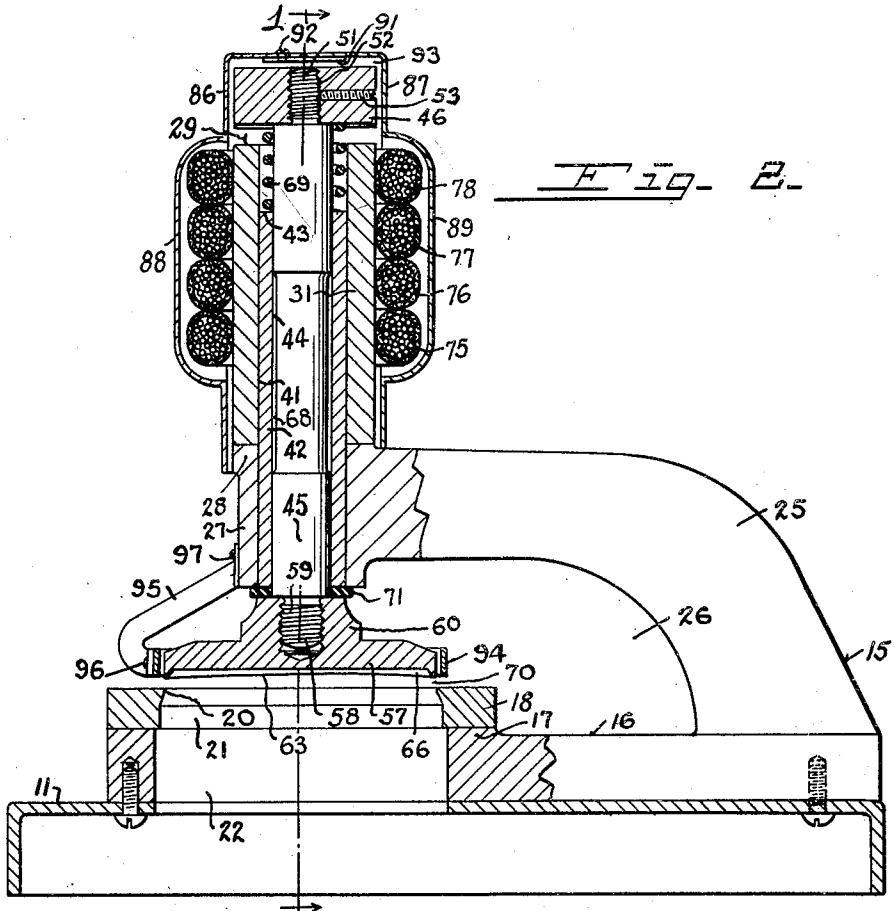
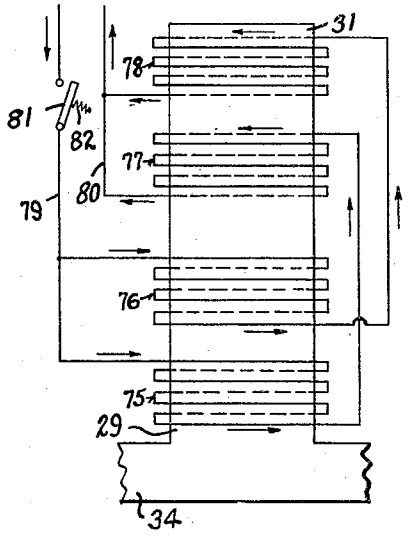


Fig. 2.

Fig. 5.



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Patented July 14, 1931 1,814,563

UNITED STATES PATENT OFFICE

LEO R. LE TANG, OF CINCINNATI, OHIO

ELECTRICAL OPERATING MEANS

Application filed August 27, 1928. Serial No. 302,270.

My invention is exemplified as applied to a machine employing a reciprocating cutter. It is primarily intended for cutting brittle objects and to provide the same with clean cut and unbroken edges during the cutting.

It is the object of my invention to provide novel electrical operating means; further, to provide a novel arrangement of electro-magnet and reciprocating actuated part; and, further, to provide novel means for reciprocating an actuated part whereby quick and forceful cutting movements are imparted to the actuated part.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Fig. 1 is a vertical axial section of the same, taken in the plane of the line 1—1 of Fig. 2, with the armature shown in attracted position.

Fig. 2 is a vertical axial section of the same, taken in the plane of the line 2—2 of Fig. 1, the armature being shown in retracted position.

Fig. 3 is a cross-section of the same taken in the plane of the line 3—3 of Fig. 1.

Fig. 4 is a bottom view of the armature; and

Fig. 5 is a diagrammatic representation of the electric circuit.

A stand 11 is arranged to be positioned at suitable height for operation by a person sitting or standing at a table.

A yoke 15 has a suitable base 16 secured to the stand and has a die support 17. A die 18 is releasably secured to the die support, as by means of bolts 19. This die is represented as the outer die and as provided with a circular cutting edge 20 surrounding an opening 21, the base and stand being provided with an opening 22, through which the object cut may pass from the die, to be delivered therefrom in suitable manner.

The yoke further comprises an arm 25 extending upwardly from the base and overhanging the base so as to provide a clearance space 26 in the yoke for the reception of material to be cut. The free end of the arm is provided with a bearing 27, on which there is a shelf 28. An electro-magnet 29 is secured to the shelf, as by means of bolts 30 received upwardly through holes in the shelf and into threaded holes in the body of the electro-magnet.

The electro-magnet is shown of the horseshoe type, and as comprising an intermediate limb 31 and side limbs 32, 33, at the respective sides of the intermediate limb, the limbs being connected by a bar 34. Structurally, the electro-magnet is formed by laminated magnet steel or iron sheets piled together and rigidly connected by rivets 35.

The intermediate limb and connecting bar of the magnet are provided with a bore 41, in which there is a bushing 42 shorter than the bore, for forming a shoulder 43 at the upper end of the bushing, and providing an enlarged bore above the bushing. The bushing is provided with a smaller bore 44, which forms a bearing for a reciprocating plunger 45.

An armature 46 is arranged to be received across the free ends of the limbs 31, 32, 33. This armature is preferably constructed of laminated magnet steel or iron sheets rigidly connected by rivets 47. The laminated sheets of the armature are further electrically connected by means of electro-conductive cross-strips 48 let into grooves 49 extending crosswise of the laminated sheets. There is a pair of each of these cross-strips, which may for instance be of copper, complemental to each of the side limbs 32, 33, of the electro-magnet, the strips of each pair being electrically connected at their ends by continuations of the strips for forming loops neutralizing eddy currents in the armature.

The armature is fixed to the plunger by providing the plunger with a reduced threaded end 51 received in a threaded hole 52 in the armature. A setscrew 53 is threaded in the armature, the end of the setscrew being arranged to be clamped against the reduced threaded end of the plunger when the armature has been properly threaded on the plunger, for clamping the armature and plunger together.

The middle portion of the armature is

preferably provided with a slight recess 55 opposite the middle limb 31 of the electro-magnet, (Fig. 1), so as to provide a slight air gap between said middle limb and the armature, when the armature has been fully attracted toward the electro-magnet, or the end portions of the armature are seated on the complemental ends of the side limbs 32, 33, of the electro-magnet. This insures ready release of the armature.

A complemental die-member 57, which is represented as the part to be reciprocated, is rigid with the lower end of the plunger, and may be suitably releasably secured thereto, as by providing the lower end of the plunger with the reduced threaded end 58 received in a threaded hole 59 in a hub 60 of the complemental die-member, a setscrew 61, threaded in said hub, clamping the complemental die-member to the plunger when the complemental die-member has been properly threaded on the plunger.

The complemental die-member is an inner die-member and is provided with a circular cutting edge 63, coacting with the cutting edge 20 of the die-member 18, for cutting the object, for instance a disk from a brittle baked sheet. The end of the inner die is provided with a recess 66 for accommodating the disk or other object being cut.

A portion of the outer periphery of the plunger is preferably recessed, as shown at 68, for providing journal surfaces for the plunger coacting with the bearing surfaces in the bushing 42 to insure free reciprocation of the plunger in the bushing. A spring 69 is received in the upper portion of the bore 41. The spring is shown as a spiral spring, the respective ends thereof being received against the shoulder 43 and the armature for normally retracting the armature away from the electro-magnet and retracting the plunger and the inner die 57 from the outer die for providing a clearance 70 between the dies for properly passing the material between the dies and properly positioning the material with relation to the dies. A cushion washer 71 is located between the upper end of the inner die and the bearing 27 so as to avoid noise or jarring upon retraction of the inner die.

The windings for the electro-magnet are preferably received about the intermediate limb thereof, and I prefer that the windings shall be in the form of a plurality of coils, exemplified at 75, 76, 77, 78, and I prefer to so electrically connect these coils that quick actuation of the reciprocating die is effected. I prefer to arrange a plurality of the coils in parallel, the parallel coils being arranged in sets, and the respective coils of the sets of coils being in series, for instance as exemplified in the diagram in Fig. 9, in which 79 and 80 represent the electric conductors connecting with the usual house or power public service wiring, by usual or suitable socket connection. An electric switch 81 is in the electric conductor 79. This switch may be a push-button switch. The switch is normally held open by a spring 82. The push-button is shown at 83 on the stand. Other switches may be employed, whether operated manually by the finger, foot, knee or otherwise, and a plurality of these switches may be employed for selective use.

Upon closing of the switch the electro-magnet is energized and causes a quick cutting movement of the reciprocating die by attraction of the armature by the electro-magnet. The armature and reciprocating plunger and die are quickly retracted upon release of the switch.

A casing 85 is provided for the electro-magnet and the armature. This casing may be made in sections 86, 87, respectively provided with bulges 88, 89, for receiving the portions of the coils 75, 76, 77, 78, extending beyond the planes of the outer faces of the electro-magnet. The lower ends of the case sections are preferably suitably secured to the shelf 28. The margins of the respective casing sections are suitably secured together. The securing means for the casing and its sections are preferably releasable so that the casing may be removed and replaced. The casing is provided with a cavity 93 in which the armature is arranged to reciprocate.

An annular guard 94 is received about the reciprocating die-member, and is spaced sufficiently from the die-member on the frame to permit the sheet to be received between the latter die-member and the guard. Arms 95 have one of their ends secured to the guard, as by means of rivets 96. The other ends of these arms are secured to the bearing 27 by means of screws 97. The lower end of this bearing preferably extends below the arm 25.

In operation, when it is desired to cut disks or other objects, the sheet from which the disks or other objects are to be cut is fed between the die-members and positioned so that the margin of the disk or other object is in line with the cutting edges of the dies. The switch for the electro-magnet is then closed, whereupon a quick cutting movement of the reciprocating die-member takes places, due to the energizing of the electro-magnet and the consequence attraction of the armature thereof. This movement is preferably a quick sharp strong movement, aided by providing the windings for the electro-magnet in separate coils and arranging at least a plurality of these coils in parallel in the electro-magnet. The reciprocating die and the armature recede quickly upon release and opening of the switch.

The object cut drops through the openings 21, 22, in the lower die and in the base and stand, and is suitably delivered. A clean cutting of the object is aided by the sheering form 64 of the cutting edge of the reciprocating die. The compact arrangement of the guard permits ready viewing of the sheet during placement thereof, and prevents the introduction of the finger of the operator into a dangerous position.

The provision of the air gap 55 between the intermediate limb 31 and the armature insures ready and quick release of the armature upon interruption of the electric current in the electro-magnet, and the electric connection of the laminations of the armature by means of the cross-strips 48, prevents chattering or buzzing of the armature upon attraction thereof by the electro-magnet, and aids in quiet operation of the device.

The device is simple and strongly constructed, the operating parts are protected from dust, and extremely rapid and safe operation of the device is insured.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. The combination of a frame, a solenoid mounted thereon, said solenoid comprising an intermediate limb, side limbs spaced therefrom, a connecting bar connecting one of the ends of all said limbs, and a plurality of coils about said intermediate limb and located in the spaces between said intermediate limb and said side limbs and extending outwardly beyond the planes of said limbs, said coils including a plurality of sets, each set including coils arranged in parallel and the coils of the respective sets arranged in series, said intermediate limb and said cross-bar provided with a bore, a plunger in said bore, an actuated member carried by said plunger, and an armature at the other of the ends of said limbs having operative connection with said plunger, the end portions of said armature arranged to seat on said side limbs when said armature is attracted and the middle portion of said armature provided with a recess proximate to and in line with said intermediate limb for forming an air gap between said armature and said intermediate limb when said armature is attracted.

2. The combination of a frame provided with a bearing, an actuated member, a solenoid mounted on said frame, said solenoid comprising an intermediate limb, side limbs spaced therefrom, a connecting bar connecting one of the ends of all said limbs, and a plurality of coils about said intermediate limb and located in the spaces between said intermediate limb and said side limbs, said intermediate limb and said cross-bar provided with a bore in line with said bearing, a bushing in said bearing and in said bore, said bushing extending throughout the greater portion of the length of said bore, said bushing being shorter than the combined lengths of said bearing and said bore for providing a slide bore in said bushing and a larger bore in said intermediate limb spaced from said bearing, the inner end of said bushing forming a shoulder, an armature at the other of the ends of said limbs extending across the other ends of all of said limbs, a plunger in said bushing, one end of said plunger having operative connection with said armature, the end portions of said armature arranged to seat on said side limbs when said armature is attracted and the middle portion of said armature provided with a recess surrounding said plunger proximate to and in line with said intermediate limb for forming an air gap between said armature and said intermediate limb when said armature is attracted, said plunger having slide connection in said bushing, an actuated member at the other end of said plunger, and a retracting spring in said larger bore between said shoulder and said armature.

In testimony whereof, I have hereunto signed my name.

LEO R. LE TANG.