July 20, 1965 F. V. THIEMANN 3,195,453

MAGNETICALLY ACTUATED PRINT HAMMER

Filed Dec. 26, 1962

Fig. 1.

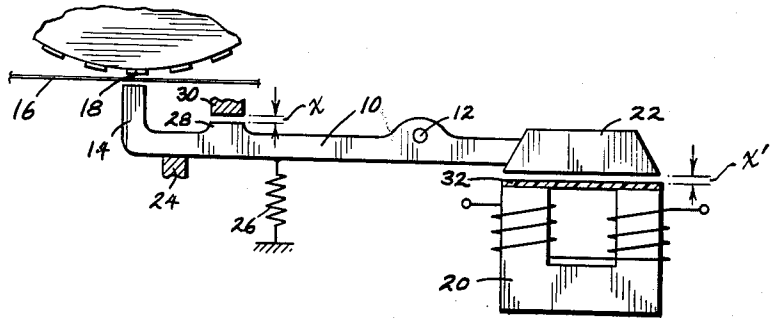


Fig. 2.

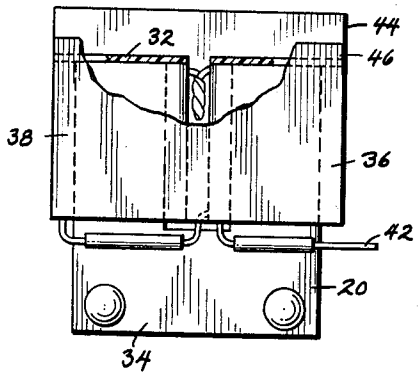
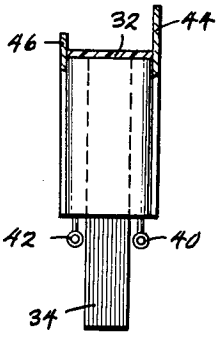


Fig. 3.



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MAGNETICALLY ACTUATED PRINT HAMMER

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This invention, generally, relates to printing assemblies and relates more particularly to an improved assembly in which the dwell time of a magnetic-actuated printing hammer against the recording medium is reduced so as to reduce character smear.

In the printing assemblies known to the art, a hammer arm usually is provided having a printing head at one end and an armature at the other end. The hammer arm is mounted pivotally about a centrally disposed axis, so that a momentarily-actuated electromagnet will attract the armature to pivot the hammer arm about the axis to bring the printing head into contact with the recording medium.

Although the motion of the printing head is arrested by a penetration stop, the armature continues to move under its momentum, thereby flexing the hammer arm. During this flexure, the printing head remains in contact with the recording medium until the armature rebounds against the flexure of the arm. The usual relative motion between the recording medium and the character, coupled with the dwell time of contact between the printing head and the recording medium, causes character smear which adversely affects the legibility of the recorded information.

Therefore, it is a primary object of this invention to reduce the dwell time of a printing hammer assembly actuated by a momentarily energized electromagnet.

In accordance with this object, there is provided in a preferred embodiment of this invention a printing assembly having a hammer arm pivotally mounted on an axis and having a printing head at one end. A penetration pad is formed on the hammer arm between the pivot and the head to coact with penetration stop for limiting the travel of the hammer head. An armature is attached to the other end of the hammer arm adjacent an electromagnet which, when momentarily energized, will attract the armature toward the electromagnet thereby tripping the printing assembly. A nonmagnetic shim or shims is provided on the face of the electromagnet, and the shim thickness is built up until the armature rebounds from the shim at the same time as the penetration pad rebounds from the penetration stop. In this manner, flexure of the hammer arm is eliminated. Since both the armature and the hammer rebound, dwell time of the hammer head against the paper is reduced. Thus character impression can be made without smear and in legible fashion.

Having briefly described this invention, it will be described in greater detail along with other objects and advantages in the following detailed description of the specification, which description can best be understood by reference to the accompanying drawings, in which:

FIG. 1 is an elevation view, partially in schematic form, of a printing assembly in accordance with the present invention;

FIG. 2 is a detailed side view, partly in section, of the electromagnet shown in FIG. 1; and

FIG. 3 is an end view of the electromagnet shown in FIG. 2.

In FIG. 1, there is shown a printing assembly having a hammer arm **10** pivotally mounted about an axis **12**. At one end of the arm and integrally formed therewith, a printing hammer head **14** is formed for striking against a recording medium **16** to apply an impression of the character **18** when an electromagnet **20** is energized momentarily to attract an armature **22**, attached at the other end of the arm **10**. The rest or retracted position of the armature assembly is defined by a timing stop **24** into engagement with which the hammer arm **10** is urged by a spring **26**.

To avoid excessive penetration into the recording medium by the printing hammer head **14**, a penetration pad **28** is provided intermediate the axis **12** and the printing hammer head **14** to coact with a penetration stop **30** for defining the travel of the hammer head **14**.

When the electromagnet **20** is energized momentarily, the hammer arm **10** pivots about the axis **12** and the hammer head **14** strikes the recording medium **16** at the same time that the penetration pad **28** strikes the penetration stop **30**. However, since the armature **22** now is moving, its momentum will cause continued movement of the armature causing bending or flexure in the hammer arm **10**. Until the flexure of the arm **10** has overcome the momentum of the armature **22**, the hammer head **14** will remain in contact with the recording medium **16**, resulting in character smear due to relative motion between the character **18** and the medium **16**.

To reduce or eliminate such dwell time, there is provided a shim or shims **32** bonded to the poles tips of the electromagnet **20**. This shim or shims is of non-magnetic material so as to have no influence on the magnetic field established by the electromagnet.

The shim thickness is selected, necessarily, by trial and error so that the armature **22** will strike the shim **32** slightly in advance of the time that the penetration pad **28** strikes the penetration stop **30**.

The thickness of the shim **32** and the distance x' must be related to the distance x in a critical manner to allow for incremental compression of the shim **32**. The selection of shim thickness must accomplish the result that the pad **28** will rebound instantly from the stop **30**, without dwell and without multiple impact for each hammer stroke.

Therefore, no arm flexure occurs with both the armature **22** and the hammer head **14** rebounding simultaneously in a crisp and sharp manner. Thus, dwell time of the hammer head **14** on the recording medium **16** is reduced to an absolute minimum.

The shim material is chosen to be resilient, nonmagnetic, and wear resistant. For example, excellent materials for this purpose are the commercially available polyamides, such as Du Pont's nylon.

The electromagnet **20**, in its usual form, is shown in FIGS. 2 and 3 consisting of a generally U-shaped core **34** with a plurality of stacked laminations, about the legs of which is provided coils **36** and **38**, coupled together serially. Energy is applied to both coils through terminals **40** and **42**. The shim **32** is incorporated on the top of the coils and encased within the protective side plates and guide assembly members **44** and **46**.

In this manner, there is provided a printing assembly in which dwell time of the printing hammer is minimized. Since the armature rebounds from the shim at the same time as the penetration pad rebounds from the penetration stop, return of the hammer arm to the rest position will be accomplished substantially without dwell. No flexure of the hammer arm due to the momentum of the moving armature will now adversely affect dwell time of the hammer head against the recording medium. The shim, of course, provides the additional advantage of reducing the residual magnetism in the actuated position and reduces the wear of the penetration stop and pad.

This invention may be variously modified and embodied within the scope of the subjoined claims.

What is claimed is:

1. A printing assembly having

a hammer arm pivotally mounted on a centrally disposed axis,

said hammer arm having a printing hammer head on one end of said arm,

a penetration pad formed adjacent said hammer head for abutting against a stop to limit the movement of the hammer head toward its printing position,

an armature attached to the other end of said arm, the distance between said axis and said penetration pad along the hammer arm being greater than the distance between said axis and said armature,

an electromagnet having pole faces positioned adjacent said armature for momentary energization to pivot said hammer arm about said axis, and

a penetration stop to coact with the penetration pad defining a striking position of said printing assembly,

the improvement comprising,

a shim positioned on said electromagnet pole faces to reduce the distance of travel for said armature to less than the distance of travel for said penetration pad so that the inertia of the armature is overcome by the time the hammer arm begins retracting from a printing position,

the thickness of said shim being selected so that the armature rebounds from the surface of said shim

simultaneously with the rebound of said penetration pad from said penetration stop,

whereby the dwell time for contact between the penetration pad and stop is reduced to a minimum.

2. An assembly in accordance with claim 1 in which said shim is formed of a non-magnetic resilient and wear-resistant plastic.

3. A printing assembly in accordance with claim 1 which includes a timing stop and spring means urging said hammer arm into engagement with said timing stop.

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