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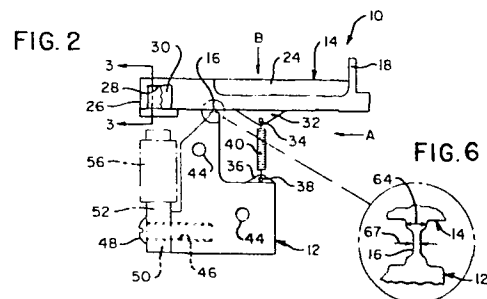
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(54) **Print hammer construction.**

(57) A print hammer construction (10) comprising a base portion (12), a print hammer arm (14) carrying an armature (30) adjacent one end thereof, and a hinge portion (16) joining the arm (14) with the base portion (12) so as to enable the arm (14) to pivot with respect to the base portion (12). The base portion (12), arm and hinge portion (16) are integrally formed of the same material, such as moulded plastics material, to form a one-piece unit. The base portion has a solenoid (50, 56, 58) secured thereto to cooperate with the armature (30) to move the other end (18) of the arm into printing relationship with a record medium (25) when the solenoid is energized and a spring (40) returns the said other end against a stop (42) when the solenoid is deenergized.



Print Hammer ConstructionTechnical Field

This invention relates to a print hammer construction which may, for example, be used in printing bar codes or alpha-numeric characters. The invention is concerned in particular with a high-speed print hammer construction of the kind including a print hammer arm which is pivotally mounted on a base portion and which carries an armature adjacent one end thereof, which armature cooperates with a solenoid to move the other end of the arm into printing relationship with a record medium when the solenoid is energized.

Background Art

In prior art high-speed print hammer constructions of the kind specified the print hammer arm is pivotally mounted on a shaft. Problems have been experienced with such constructions in that there is a tendency for the print hammer arm assembly to break down at the pivot area due to excessive wear occurring at this area during high-speed operation. U.S. Patent No. 3 200 739 discloses a print hammer module arrangement which goes some way to overcoming this problem, the arrangement involving the use of print hammer arm bearings of increased length with adjacent arms being mounted on separate shafts. However, with this arrangement wear on the bearings will still occur to some extent, and the use of separate shafts increases the complexity and cost of the module.

Disclosure of the Invention

It is an object of the present invention to provide a print hammer construction which is of low cost and which substantially overcomes the above-mentioned problem experienced with prior art high-speed print hammer constructions of the kind specified.

According to the invention, there is provided a print hammer

construction including a base portion; a print hammer arm pivotally mounted on said base portion and carrying an armature adjacent one end thereof; and a solenoid mounted on said base portion and cooperating with said armature to move the other end of said arm into printing relationship with a record medium when said solenoid is energized, characterized in that said arm is joined to said base portion by means of a hinge portion allowing said arm to pivot with respect to said base portion, and in that said base portion, arm and hinge portion are integrally formed to provide a one-piece unit of the same material.

The invention is based on the discovery by the Applicants that in a print hammer construction of the kind specified a one-piece form of construction of the base portion, the arm and a hinge portion provides a frictionless pivot which performs satisfactorily at high speed over a long operating life without failure. Also, a print hammer construction in accordance with the invention has the additional advantages that it is low in cost and easy to manufacture, has a reduced assembly time, and operates with a low level of noise.

Brief Description of the Drawings

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a general perspective view of a print hammer construction according to the invention;

Fig. 2 is a plan view of a base portion, arm, and hinge portion of the print hammer construction, which hinge portion is integrally formed with the arm and base portion to form a one-piece construction;

Fig. 3 is a cross-sectional view of one end of the arm taken along the line 3-3 of Fig. 2;

Fig. 4 is an end view of the print hammer construction,

looking from the direction of arrow A in Fig. 2;

Fig. 5 is an end view of the print hammer construction, looking from the direction of arrow B in Fig. 2; and

Fig. 6 is an enlarged view of the integrally formed hinge portion shown in the dashed circle in Fig. 2.

Best Mode of Carrying out the Invention

Fig. 1 is a general perspective view of a print hammer construction according to the invention and being designated generally as 10. The construction 10 includes a base portion 12, a print hammer arm 14, and a hinge portion 16 which are integrally formed by conventional moulding techniques into a one-piece unit or construction from a material such as, for example, polypropylene plastic.

The arm 14 (Fig. 1) has a first end 18 to which a printing hammer or element 20 (shown in dashed outline) is secured by fasteners 22. The printing element 20 may be shaped as a rectangle to print a bar when any of the conventional bar codes is printed. For example, the printing element 20 coacts with a stationary printing anvil or bar 23 of the desired shape and dimensions to print a bar on a record medium 25 when a ribbon 27 is positioned between the record medium 25 and the printing bar 23, and the printing element 20 impacts against the printing bar 23. When the printing of alpha-numeric characters is desired, the printing bar 23 may be replaced with any conventional character carrier such as a rotating character drum (not shown) having the alpha-numeric characters thereon. The printing bar 23 may also be of the "porous ink" variety eliminating the need for ribbon 27 when especially low-level impact printing is desired. The arm 14 has a reduced area forming a rib 24 to provide rigidity while reducing the mass of the arm to thereby provide a fast hammer cycle time. The rib is located between the first end 18 and the hinge portion 16.

The arm 14 has a second end 26 which has an opening 28

(Fig. 2) therein to receive the armature 30 (Fig. 1). The armature 30 is made of .2% silicon iron and is press fitted and cemented in the opening 28 to be retained therein. Alternatively, the armature 30 may be placed in the mould in which the construction 10 is moulded and the arm 14 may be moulded therearound during the moulding process to fix the armature 30 therein. The armature 30 has a long axis which is perpendicular to the planes formed by the main faces of the one-piece unit. The arm 14 also has a projection 32 (Fig. 2) with a hole 34 therein, which projection 32 is opposite a similar projection 36 on the base portion 12 and having a hole 38 therein to enable a tension spring 40 (Figs. 1 and 2) to be mounted in the holes 34, 38 to return the arm 14 against a stop 42. The stop 42 is made of a rigid material such as metal to minimize the rebounding of the arm 14 when it is returned against the stop 42 by the spring 40. The stop 42 is secured to a frame member (not shown) in which the construction 10 is used; the base portion 12 has mounting holes 44 therein to enable the construction 10 to be secured to the mentioned frame member when in the assembled state shown in Fig. 1.

The base portion 12 (Fig. 2) has a mounting hole 46 therein to receive a fastener 48 which secures a "U"-shaped solenoid core 50 to one side of the base portion 12 as shown in Figs. 1 and 2. The core 50 has first and second legs 52 and 54 with energizing coils 56 and 58 being wound on the legs 52 and 54, respectively. When the leads 60 of the coils 56 and 58 are energized, the armature 30 is attracted to the pole faces (like 62) of the legs 52 and 54 causing the arm 14 to pivot on the hinge portion 16, thereby bringing the printing element 20 into printing relationship with a record medium 25 as previously described. In the embodiment shown, the record medium 25 is moved in the direction of arrow 66 (Fig. 1) in printing relationship with the printing element 20 and the printing bar 23 although other relative movements therebetween can be effected for a particular application.

Figs. 3, 4, and 5 show various views of the construction 10.

The base portion 12, arm 14 and hinge portion form a flat one-piece unit whose main faces substantially lie in parallel planes and which is relatively easy to mould. The hinge portion 16 extends over the thickness of the base portion 12 and has the profile shown in Fig. 6. The hinge portion 16 is shown in exaggerated size in Fig. 6, and when the construction 10 is just moulded, the hinge portion 16 as measured by the dimension line 64 has a width of about .25 to .508 mm. While the construction 10 is still hot after moulding, the hinge portion 16 is flexed by pivoting the arm 14 to its limits in both directions. This flexing of the hinge portion 16, while it is still hot, stresses the outer fibres thereof and causes the hinge portion 16 to be slightly "narrowed down" as shown by the dimension line 67, to a width of about .375 mm, producing a hinge portion 16 having a long life; because this flexing technique is conventional, it need not be described in any further detail. The hinge portion 16 is located at a point approximately one third of the length of the arm 14 from the second end thereof.

In the embodiment of the construction 10 selected to portray this invention, the height of the printing bar 23 as viewed in Fig. 1 is 8 mm. and the width thereof is .25 mm. wide. Successive bars printed by the construction 10 are spaced .88 mm. apart and it can print the bars at a speed of movement of the record medium of approximately 220 mm. per second. The actuation time of the print hammer construction 10 is about 4 milliseconds per impact. The printing element 20 has a contact area or face 68 corresponding in shape to the shape of the printing bar 23; however, the face 68 is slightly larger than the dimensions of the printing bar 23.

CLAIMS:

1. A print hammer construction (10) including a base portion (12); a print hammer arm (14) pivotally mounted on said base portion (12) and carrying an armature (30) adjacent one end (26) thereof; and a solenoid (50, 56, 58) mounted on said base portion (12) and cooperating with said armature (30) to move the other end (18) of said arm (14) into printing relationship with a record medium (25) when said solenoid (50, 56, 58) is energized, characterized in that said arm (14) is joined to said base portion (12) by means of a hinge portion (16) allowing said arm (14) to pivot with respect to said base portion, and in that said base portion (12), arm (14) and hinge portion (16) are integrally formed to provide a one-piece unit of the same material.
2. A construction according to claim 1, characterized in that said base portion (12), arm (14) and hinge portion (16) are made of plastics material.
3. A construction according to claim 2, characterized in that said plastics material is polypropylene.
4. A construction according to any one of claims 1 to 3, characterized in that said one-piece unit is flat, the main faces of said unit substantially lying in parallel planes.
5. A construction according to claim 4, characterized in that said one end (26) of said arm (14) has an opening (28) therein, and in that said armature (30) is elongated and is mounted in said opening (28) so that its longitudinal axis is perpendicular to said planes.
6. A construction according to claim 1, characterized in that said solenoid (50, 56, 58) has a U-shaped member (50) having

energizing coils (56, 58) thereon and being provided with pole faces (62) arranged in operative relationship with said armature (30).

7. A construction according to claim 1, characterized by a spring (40) secured to said arm (14) and said base portion (12, 36) to return said other end (18) of said arm (14) to an inoperative position against a stop (42) after said solenoid (50, 56, 58) is de-energized.

8. A construction according to claim 1, characterized in that said hinge portion (16) is located approximately one third of the length of said arm (14) from said one end (26) thereof.

9. A construction according to claim 1, characterized in that said arm (14) has a reduced portion forming a rib (24) located between said hinge portion (16) and said other end (18) of said arm (14).

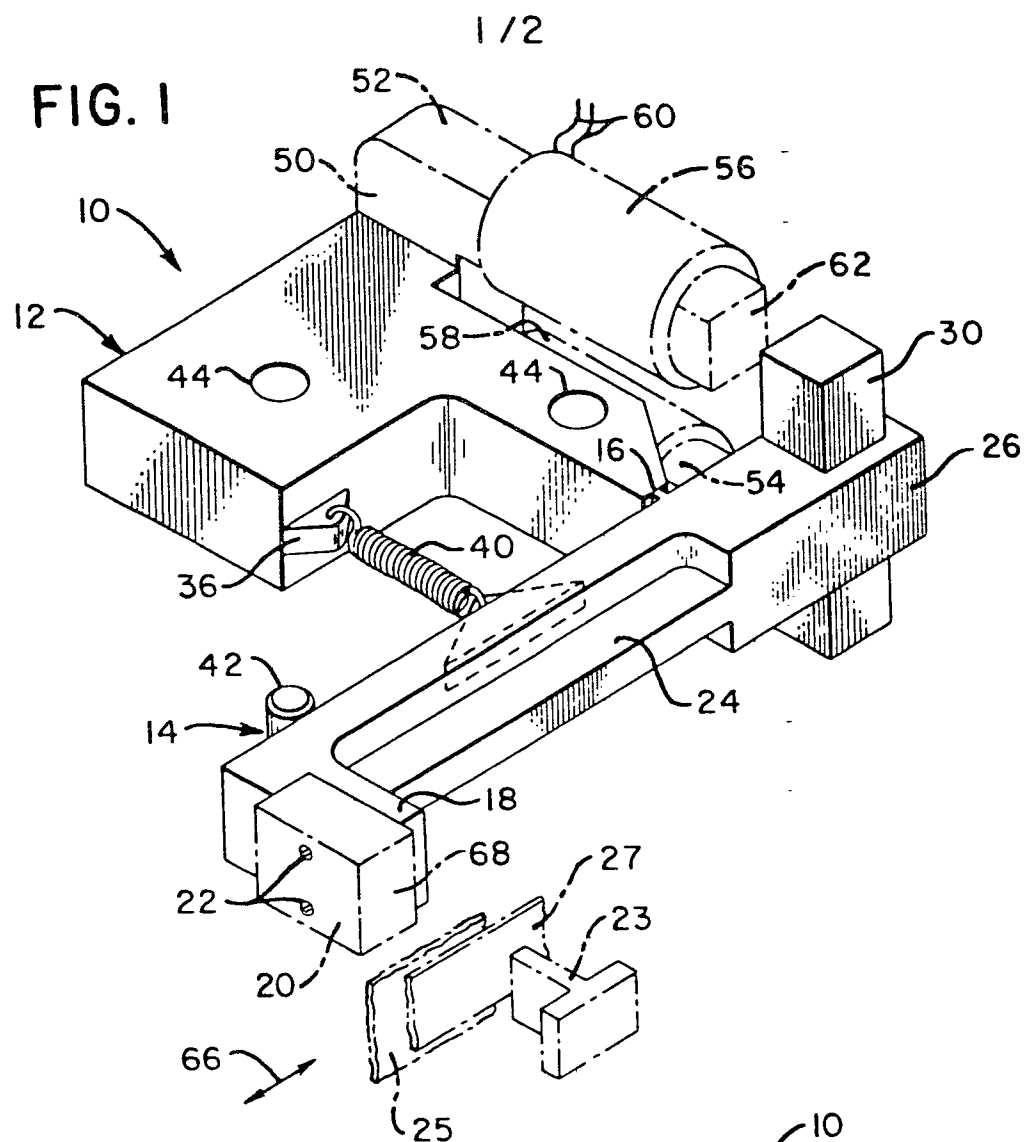
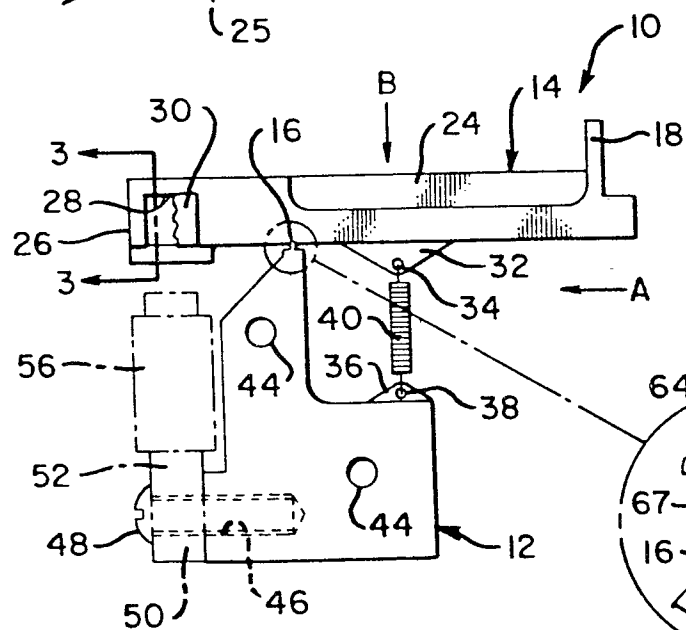
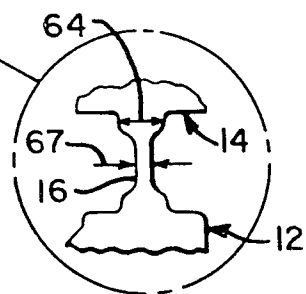
**FIG. 2****FIG. 6**

FIG. 3

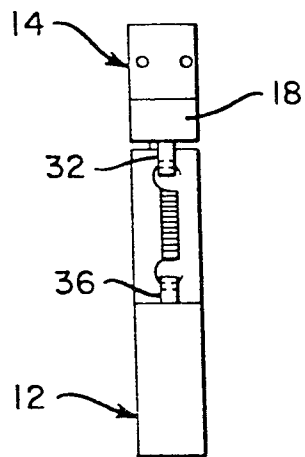
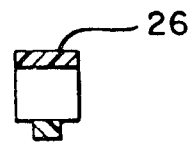
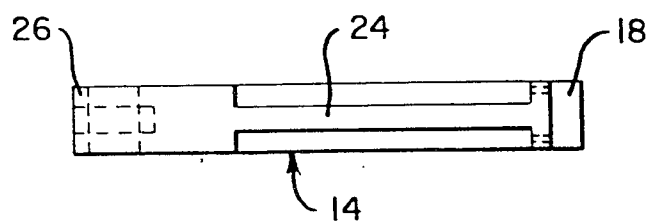


FIG. 4

FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

0022340

Application number

EP 80 30 2174

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ⁴)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>FR - A - 1 594 281</u> (ANKER-WERKE) * Whole document *	1,4,8	B 41 J 9/133 9/10
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	<u>US - A - 3 513 773</u> (G. PONZANO) * Whole document *	4,6,7	

			TECHNICAL FIELDS SEARCHED (Int.Cl. ⁴)
			B 41 J
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			& member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	06-10-1980	VAN DEN MEERSCHAUT	