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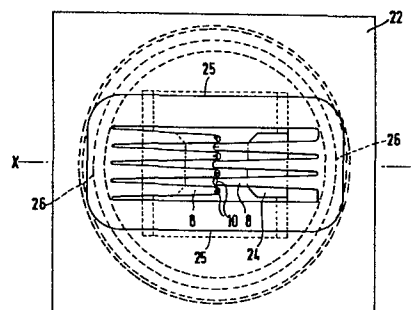
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(54) **Impact matrix printer having resiliently mounted printing elements driven by striking needles.**

(57) A matrix printer which has a printing head including a line of printing needles. A plate (22) is disposed over the end of the printing head (4) and is formed to constitute a plurality of leaf springs (8) each of which carries at one side an anvil (9) aligned with a respective printing needle and at its other side a stud (10) which has an impact area smaller than or different to the impact area of the respective printing needle. Striking movement of the printing needle deflects the spring to cause the respective stud to mark the printing sheet. The arrangement facilitates the production of different styles of characters, the production of finer detail in characters and provides printing members which are more easily replaceable than printing needles.

FIG 4



TITLE MODIFIED
see front page

"MATRIX PRINTER"

BACKGROUND TO THE INVENTION

This invention relates to a matrix printer, that
is to say a machine which prints characters by means of
5 an array including at least one line of striker
needles or similar impact members which can be selectively
displaced to print on a sheet or other target surface
dots or other elementary printing marks in patterns
which constitute printed characters. The needles are
10 normally contained in a printing head. In use, the
printing head moves relative to the sheet of paper or
other printing surface in a direction which is transverse
the line or lines of needles in the array. The movement
of the printing head is usually stepwise and when the
15 printing head is stationary the printing needles are
actuated in accordance with a predetermined programme
to strike the sheet or surface through an ink tape or
ribbon. The pattern of dots thus printed after a
complete traversal of the printing head across the sheet
20 usually constitutes a line of characters of which the

maximum height corresponds to the length of the array of printing needles.

The quality of characters printed by an impact matrix printer is determined by the size of the impact area of the printing needles. Moreover, the needles are subject to considerable wear and the quality of the characters may be degraded as the striking ends of the needles become worn. One purpose of the present invention is to alleviate at least one of these disadvantages.

SUMMARY OF THE PRIOR ART

Many forms of impact matrix printer are known; two examples are provided by British Patent Specification No. 1539661 in the name of The Singer Company, and the published Specification No. 0001472 of European Patent Application No. 78300109.2 in the name R.C. Sanders Technology Systems Inc.

It has been proposed to provide a high performance printer which includes an endless belt carrying resilient fingers on each of which is disposed a printer needle and which can be struck by striker needles of a stationary head. Such an arrangement is described in British Patent Specification No. 1493719 but the arrangement described in that specification is not applicable to matrix printers in which, as for the

present invention, the printing head moves relative to the printing surface.

SUMMARY OF THE INVENTION

The invention particularly relates to a matrix
5 printer which comprises a printing head which has
an array of striker needles disposed in at least one
line, means defining a target surface and means for
causing relative movement between the printing head
and the said surface along a line transverse the
10 said line of needles. The improvement according to
the present invention comprises the provision of a
frame which is carried on or adapted for carriage by
the printing head and includes a plurality of resiliently
flexible members each positioned for displacement by a
15 respective striker needle and carrying a printing member
which has, with respect to the target surface, an impact
area substantially different from the striking area of the
respective striker needle .

DESCRIPTION OF THE DRAWINGS

20 In the accompanying drawings:

Figure 1 illustrates a disadvantage in character reproduction using matrix dot printers;

Figure 2 illustrates schematically part of an impact assembly in a printing head of a matrix printer
25 according to the present invention;

Figure 3 illustrates schematically part of a matrix printer according to the invention;

Figure 4 illustrates the front face of a printing head including the improvement provided by the present invention; and

Figure 5 is a sectional view along the line X-X shown in Figure 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The reader of the present specification will be presumed to be familiar with the general manner of construction and operation of matrix printers, including those described in the specifications hereinbefore mentioned. The following description includes a description by way of example of one embodiment of the invention; it will be apparent that various modifications may be made by those skilled in the art.

Figure 1 is an explanatory diagram which shows the impact area 1 of a printing needle aimed to provide a dot at the end of a notional serif 2 at one side of the foot 3 of a character. It will be observed that the impact area of the printing needle is considerably larger than the area which is required to reproduce the end of the serif accurately. There is, obviously, a limit to the extent to which the diameter of a printing needle can be reduced whilst retaining sufficient

strength in the printing needle. It is, having regard to the disadvantage shown by Figure 1, desirable to make the impact area of a printing member either smaller than or of different shape to the impact area of the primary printing or striking needle. It is within the scope of the present invention to make the area non-circular, for example oval-shaped and to associate with the various striker needles, as will be described hereinafter, impact members which may be oval-shaped yet differently oriented to facilitate the production of serifs. For example, needles at the ends of an array may be associated with impact members which are oval and disposed along a line parallel to the line of characters, so that horizontal serifs may be more easily reproduced and to associate with needles between the ends of a line of needles impact members which are oval-shaped and disposed vertically with respect to the characters so as to facilitate the production of vertical serifs. However, in the embodiment which is to be described it will be presumed that the impact areas of the printing members associated with the needles are of smaller impact area than the impact area of the striker needles.

In Figure 2, the reference numeral 5 denotes the end of one of a line array of axially displaceable striker

needles which project slightly from the end of a printing head 4. In earlier practice the end of the needle has struck a target sheet 6, an inked ribbon 7 being interposed between the needle and the sheet 6. It has been proposed to reduce the impact area of the needle by appropriate shaping of the end but the theoretical benefits of such a proposal are outweighed by the increased wear of the end of the needle and certain difficulties in the manufacture thereof.

The assembly shown in Figure 2 includes a resiliently flexible member constituted in this embodiment by a cantilevered leaf spring 8 which carries at or adjacent its free end an anvil 9 on that surface of the leaf spring which faces the respective end of the striker needle. On the opposite surface of the leaf spring 8, facing the ribbon 7, is a printing member in the form of a stud 10 which is shaped to present a striking surface of which the area is smaller than or of different shape to the impact area of the needle 5. When the needle 5 advances in the direction of the arrow 11 and strikes the anvil 9, the spring 8 flexes and the stud 10 advances towards the sheet 6. Thereafter, the needle having been withdrawn in the direction of arrow 12, the leaf spring reflexes

towards its rest position and the stud 10 is withdrawn from the sheet 6.

Figure 3 illustrates schematically the principal parts of a printer. A roller 13 provides support for a sheet of paper 14. Between a supply spool 15 and a take-up spool 16 extends a carbon ribbon 17. The printing head has a body 18 and a front part 19 which carries at its outer end a guide 20 for a line of striker needles which are each axially displaceable by means of drivers within the path 19. As thus far described the printer is of known form, as shown for example by the earlier-mentioned European patent application. As will be described with reference to Figures 4 and 5, the printer carries a mounting block 21 for a frame in the form of a plate 22 which carries a set of leaf springs and studs.

Reference will now be made to Figures 4 and 5. Within the printing head is, as usual, a row of printing needles 23 (of which only one can be seen in Figure 5. The end of the body 19 of the printing head is circular; from the end of the body there extends the guide 20 which serves to guide the printing needles axially. The needles normally protrude slightly from the end surface 24 of the guide 20.

The rectangular mounting block 21 has a central circular aperture which accommodates the guide 20 and is wider at one end so that the mounting block fits over the cylindrical body 19 of the printing head.

5 The block may be fixed to the head by screws or an appropriate cement.

A frame for the leaf springs 8 is constituted by the plate 22 of which the central part is of reduced thickness and is formed in the manner of an
10 interdigitated comb comprising side portions 25, and end portions 26, the latter providing a base support for a plurality of cantilevered leaves 8 which extend so that their ends lie on a common line extending across the tops of the needles 23. Each leaf spring 8
15 is provided with an anvil 9 and a stud 10 as described with reference to Figure 2, the anvil 9 and stud 10 of each leaf spring being aligned with the respective needle 23.

The spring plate 22 may be made from nickle-
20 beryllium-copper or pen steel. The anvils and studs may be electrolytically deposited and comprise a suitable hard-wearing material, such as hard nickel. Alternatively the entire spring plate, studs and anvils may be photo-etched from a single sheet of any of the
25 aforementioned materials, the studs and anvils being

plated with a suitable hard-wearing material such as chromium. As mentioned hereinbefore, the sizes and shapes of the studs 10 are selected as required. They may simply be of smaller diameter than the needles 23
5 but may be shaped as thin bars or lozenges.

If the printing head includes two parallel rows of needles, the leaf spring assembly may be arranged to include leaf springs to provide resilient mounting for two corresponding rows of anvils and studs. The
10 studs of one such row may have striking surfaces in the form of thin bars aligned in one direction whereas the studs in the other row may have striking surfaces in the form of thin bars in another direction, the directions being selected to permit or facilitate the
15 formation of fine horizontal and vertical character strokes or serifs.

The frame constituted by the plate 22 may be readily detachable from the block 21 so that it can be changed when the studs become worn or when a different
20 shape of stud is required for the production of different style of character. For the purpose of easy removal, the plate 22 may be attached by screws to the block 21 but, if easy removal is not required, the plate 22 may be fixed to the block by a suitable cement.

CLAIMS:

1. In a matrix printer comprising a printing head which has an array of striker needles disposed in at least one line, means defining the target surface and means for causing relative movement between the printing head and the said surfaces along a line transverse to said line of needles, the improvement which comprises a frame disposed on the printing head and including a plurality of resiliently flexible members each positioned for displacement by a respective striker needle and carrying a printing member which has with respect to the target surface an impact area substantially different from the striking area of the respective striker needle.

2. The improvements set forth in claim 1 in which the said members are cantilevered leaf springs disposed interdigitally, the printing members comprising studs each of which is disposed near the end of each spring.

3. The improvements set forth in claim 1 or claim 2 in which the frame and flexible members are constituted by a thin metallic plate.

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FIG 1

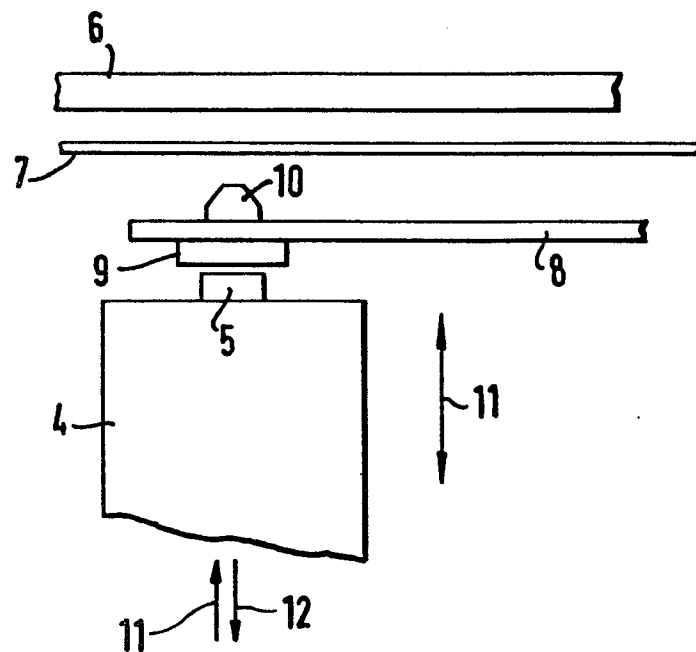
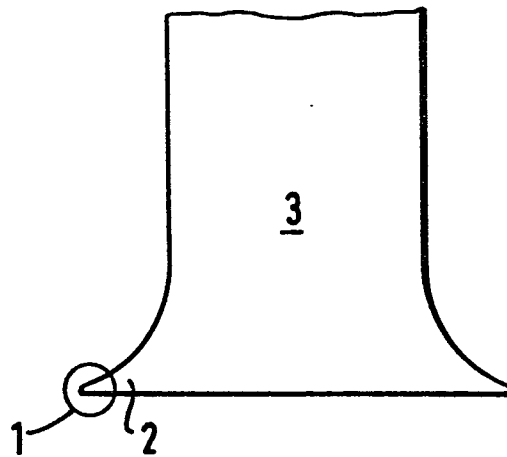


FIG 2

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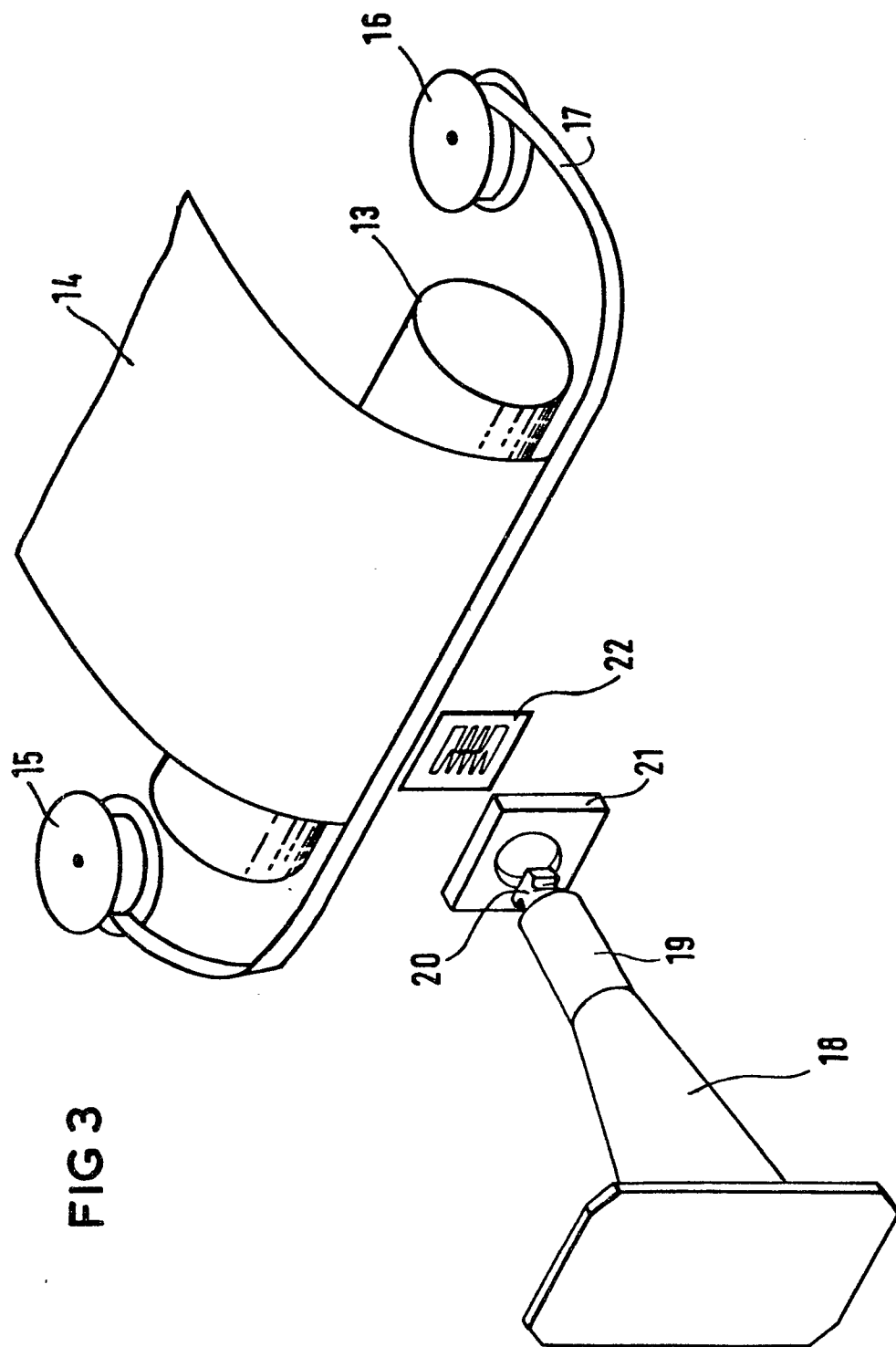


FIG 4

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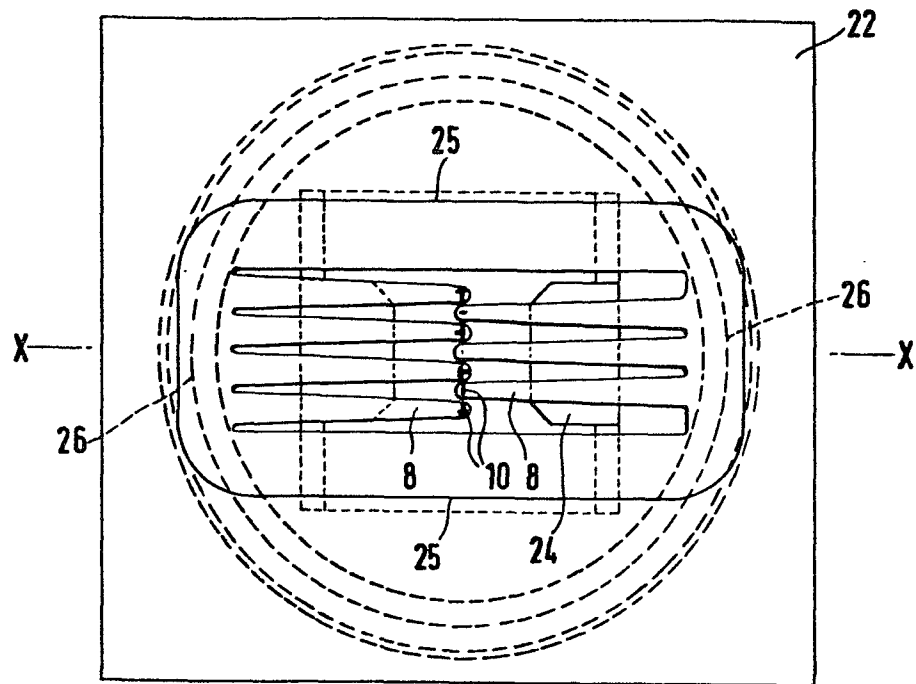
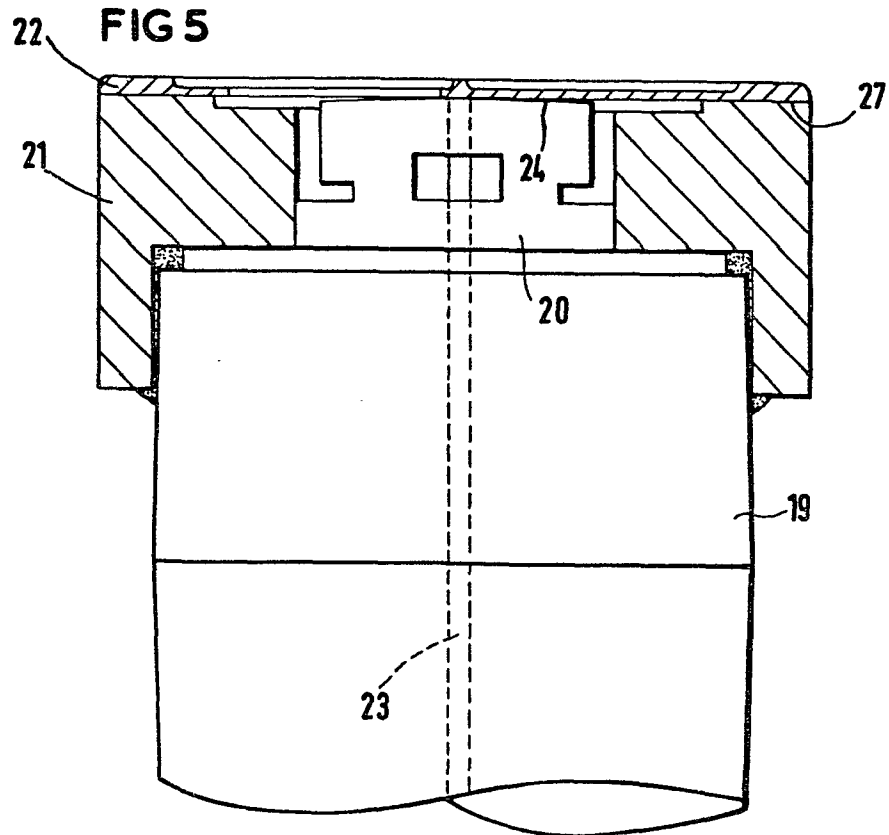


FIG 5





European Patent
Office

EUROPEAN SEARCH REPORT

0024928

Application number

EP 80 30 2994

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 4 044 668 (G.B. BARRUS)</u> * Column 5, line 61 to column 6, line 50; figures 2-5 * --	1,2	B 41 J 3/12
D	<u>GB - A - 1 493 719 (SIEMENS A.G.)</u> * Whole document * --	2	
A	<u>FR - A - 2 152 187 (ANKER WERKE AG.)</u> * Page 6, line 15 to page 7, line 7; figures 8-12 * ----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			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 The Hague		Date of completion of the search 08-12-1980	Examiner V.D. MEERSCHAUT