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(54) **Improvements in or relating to computer matrix printers.**

(57) A computer matrix printer has a ribbon carrier (26) pivotally supporting a body (12) of a printing head (14). Solenoid arrangements (32, 34) connect between the body (12) and the carrier (26) and are controlled by electronic means including a microprocessor, whereby the printing head (14) can be moved in opposite directions from a central position. Movement of the printing head (14) is therefore relative to the ribbon (16) held by the carrier (26) and enables printing in any one of three parallel discrete areas on the ribbon (16) holding different coloured inks. The microprocessor can also enable printing in further colours by over-printing one of the discrete colours with another, the over-printing being carried out when the first ink applied to the print-out (18) is still wet. Thus a plurality of colours can be provided with no registration problems and this is particularly suitable for a colour display on a video display unit. Further discrete colours may be included on the ribbon with suitable modification of the arrangement controlling movement of the printing head (14).

FIG.2

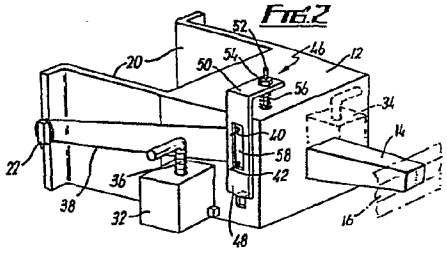
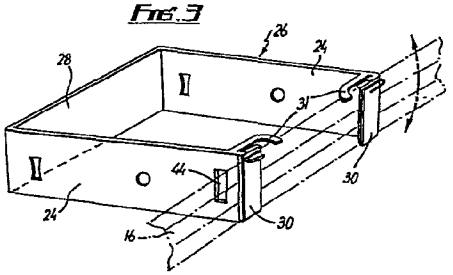


FIG.3



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Improvements in or Relating to Computer Matrix Printers

This invention is concerned with improvements in or relating to printing apparatus, and is particularly concerned with computer matrix printers capable of providing a print-out in more than two colours.

At the present time computer matrix printers of the type utilising an inked ribbon provided with a parallel arrangement of discrete colours of ink are limited to printing two colours, mainly red and black, and the print-out can be printed selectively in red or black. Printers of the type utilising an inked ribbon incorporating more colours of ink in a series arrangement, suffer from paper registration problems. Further printers have been developed incorporating a plurality of print heads for producing print-outs in different colours, but such printers have image registration difficulties.

According to the present invention there is provided printing apparatus comprising means for supporting material receiving the print-out, means retaining ink in three or more discrete colours, printing means adapted to engage the ink retaining means against the print-out material and means for moving the printing means and the ink retaining means relative to one another, the moving means being adapted to enable engagement of the printing means selectively with one of the areas of discrete colour, or with a plurality of the areas of discrete colours sequentially against the same location on the print-out material before the inks applied to the material dry thereon, whereby one

of the discrete colours or a further colour is produced on the print-out material.

Preferably, means are provided for programming the apparatus to print the discrete colours and the further colours automatically, or print the further colours when the apparatus receives appropriate instructions.

Preferably also, the moving means comprises carrier means for the ink retaining means, said carrier means being pivotally arranged relative to the printing means. Pivoting may be effected by solenoids moving the carrier means between two positions. Further, centring means may be provided to return the carrier means to a central position. With such an arrangement, the ink retaining means preferably comprises an inked ribbon having three parallel discrete areas holding different coloured inks, for example cyanne, magenta and yellow.

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

Fig. 1 is a diagrammatic plan of a first embodiment of a printing head of a computer dot matrix printer in an operative position;

Fig. 2 is a diagrammatic perspective view of the printing head of Fig. 1 without a ribbon carrier;

Fig. 3 is a diagrammatic perspective view of the ribbon carrier; and

Fig. 4 is a diagrammatic perspective view of a further embodiment of a printing head.

In a computer dot matrix printer, a print head comprises a series of needles which are moved outwardly of the print head

to engage an inked ribbon against a print-out material, in a sequence determined by programmed electronic control circuitry. The needles produce a pattern of dots on the print-out material which is subsequently utilised, for example, in association with a video display unit.

Referring to Figs. 1 to 3 of the drawings, a first print head 10 comprises a main body 12 supporting a printing head 14 having needles engageable against an inked ribbon 16 so as to move the ribbon 16 against a print-out paper 18. The ribbon 16 comprises a parallel arrangement of three discrete colours of inks for a purpose hereinafter described.

The print head main body 12 provides a pair of rearwardly extending flanges 20 mounted by means of pivot arrangements 22 on respective arms 24 of a ribbon carrier 26, such that the carrier 26 can pivot relative to the print head 10. The carrier arms 24 are interconnected by a base 28 and, at its free end, each of the arms 24 has an upwardly opening channel member 30 into which the ribbon 16 can be top loaded. Lugs 31 prevent inadvertent upward movement of the ribbon 16 once the latter has been moved therepast.

To control movement of the ribbon carrier 26 relative to the print head 10, there are provided a pair of solenoid arrangements 32, 34 one associated with each respective arm 24 of the carrier 26. Each solenoid mechanism 32, 34 is supported at a respective side of the print head main body 12 and comprises an upwardly extending plunger 36 positioned at a location on a respective arm 24 of the ribbon carrier 26 intermediate of the pivot point and the sleeve-like member 30 associated with that

arm 24. One of the solenoids is of the pull type to effect lowering of the ribbon carrier 26 relative to the print head 10, while the other solenoid is of the push type for raising the ribbon carrier 26 relative to the print head 10.

To normally maintain the ribbon carrier 26 at a location centrally of upper and lower positions, there is provided a centring mechanism in the form of a V-spring 38. The latter is supported on one of the pivot arrangements 22 and has its free ends 40, 42 engaging through an aperture 44 in the respective carrier arm 24, the ends 40, 42 being biassed against the respective upper and lower edges of the aperture 44. Movement of the carrier by a respective solenoid in an upward direction moves the end 42 towards the end 40 and compresses the spring 38, and similarly movement of the carrier in a downward direction moves the end 40 towards the end 42 and compresses the spring 38. When the respective solenoid becomes inoperative the spring 38 returns the carrier 26 to its central position.

In a modified arrangement, the solenoids may be arranged to extend horizontally on the main body, one solenoid having its plunger engageable with an outwardly extending lug on the carrier and being of the push type, with the other solenoid having its plunger fixed to an outwardly extending lug on the respective arm of the carrier. This arrangement enables the mechanism to have smaller overall dimensions.

For correct setting up of the central position, there is provided an adjustment arrangement 46 which comprises a plate 48 located between a respective one of the flanges 20 and the adjacent carrier arm 24. The plate 48 is slidably arranged on

the print head 10 by engagement of a lower end in a slot, and has a lug 50 at its upper end extending above the head 10. A threaded member 52 secured to the head 10 extends through a threaded hole in the lug 50 and a lock nut 54 is provided. A compression spring 56 surrounds the member 52 between the lug 50 and the head 10. The free ends 40, 42 of the centring spring 38 extend through an aperture 58 in the plate 48 before engaging through the aperture 44 whereby movement of the plate 48 relative to the head 10 by adjustment of the nut 54 will effect movement of the carrier 26 and alter the setting of the central position.

In the normal position of the ribbon carrier 26, the printing head 14 is aligned with the central band of colour on the ribbon 16, while in the upper and lower positions of the ribbon carrier 26, the printing head 14 is aligned respectively with the upper or lower band of the ribbon 16. Control for the print head 10 comprises electronic circuitry, including a microprocessor so programmed so as to enable printing of any one of the three colours and also printing of additional colours which can be formed by combinations of the coloured inks on the ribbon. For example, it is preferred that the three colours be yellow, cyanne and magenta and the microprocessor can be so programmed so as to print, for example green, by overprinting yellow with cyanne or vice versa, the overprinting being carried out when the first ink applied to the paper print-out 18 is still wet. Further, by varying the pressure applied to the ribbon the strength of colour applied to the print out will vary and enable additional colours to be used. In the case of a ribbon containing a light colour, e.g. yellow, it is important that this colour is

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printed first so that this ribbon stripe is not contcminated by ink pick-up from the paper during over-printing.

In a further embodiment shown in Fig. 4 (a-d), the carrier 100 mounts at the rear end of each arm 102 a guide pulley 104 whereby the ribbon 106 can pass from behind one pulley 104 to the front end of the mechanism alongside the respective carrier arm 102, and is retained by guides 108 as it passes across the front of the printing head 110. The ribbon 106 then passes to the rear end of the other carrier arm 102 and round the respective pulley 104. In this way adjustment of the carrier 100 effects only twisting of the ribbon and avoids tensioning difficulties when the whole length of ribbon 106 is raised and lowered vertically.

In this embodiment the solenoids 112 are located above one another (Fig. 4d) above and below the carrier 100, and are mounted on a plate 114 which is pivotally arranged on the head 110. The plungers 116 of the solenoids 112 are engageable with angled lugs 118 integral with the carrier 100 to control the pivotal movement of the carrier 100. The solenoids 112 are arranged so that their plungers 116 extend radially relative to the pivot axis, and thus even with adjustment of the central position in this arrangement, the movement of the plungers 116 does not alter and this is desirable so as not to affect the operation of the solenoids 112. The centring mechanism in this embodiment is a spring 120, extending between outwardly facing lugs 122 at the upper and lower ends of the solenoid mounting plate 114 and engaging against locations adjacent to the angled lugs 118.

Such a printer can therefore produce a plurality of colours on the print-out paper 18 with there being no registration problems, and it is normally desirable for up to seven colours to be available on a paper print-out needed for a colour display on a video display unit. It will be appreciated however that the invention is not limited to the use of a ribbon with three colours, as, for example, a four-band ribbon may be provided,

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with black possibly being the extra colour. It will also be appreciated that the ribbon may be provided with other colours than those specifically described, depending on the purpose of the printer.

In an alternative arrangement, the printer need not be programmed to automatically print any colour instructed but may only be programmed to print one of the ribbon colours, such that instructions have to be given as to what colours are to be used in over printing.

Although the use of two solenoids with the centring mechanism has been described, it should be appreciated that another solenoid may be provided to move the ribbon carrier to its central position, and of course the means for moving the ribbon carrier may be suitably modified when additional colours are provided on the ribbon. Also the ribbon carrier may be arranged to support the ribbon at each end of the carriage of the printer with a follower arrangement provided at the print head in order to ensure proper alignment of the ribbon at the print head location. Further, it is envisaged that the relative movement between the ribbon and the print head may be achieved by providing an arrangement for movement of the print head with the paper print-out.

Various other modifications may be made without departing from the invention, and the invention may be applied to other types of printing apparatus, such as an 'ink jet' apparatus where no inked ribbon is used but the apparatus is programmed as before to print discrete colours and further colours.

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Claims:

1. Printing apparatus comprising means for supporting material receiving a print-out, means retaining ink in discrete colours, printing means adapted to engage the ink retaining means against the print-out material, and means for moving the printing means and the ink retaining means relative to one another, characterised in that the moving means (26) is adapted to enable engagement of the printing means (14) selectively with one of the areas of discrete colours, or with a plurality of the areas of discrete colours sequentially against the same location on the print-out material (18) before the inks supplied to the material dry thereon, whereby one of the discrete colours or a further colour is produced on the print-out material (18).

2. Apparatus according to claim 1, characterised in that means are provided for programming the apparatus to automatically print the discrete colours and the further colours.

3. Apparatus according to claim 2, characterised in that the programming means comprises an electronic control in the form of an integrated circuit.

4. Apparatus according to claim 1, characterised in that means are provided for programming the apparatus to automatically print the discrete colours and receive instructions for printing the further colours.

5. Apparatus according to any of the preceding claims, characterised in that the moving means comprises a carrier (26) for the ink retaining means (16), said carrier (26) being pivotally arranged relative to the printing means (14).

6. Apparatus according to claim 5, characterised in that the moving means (26) includes a first solenoid (32) for moving the carrier means (26) in one direction relative to the printing means (14), and a further solenoid (34) for moving the carrier means (26) in the opposite direction relative

to the printing means (14).

7. Apparatus according to claim 6, characterised in that centring means (38) is provided to automatically return the carrier means (26) to a position centrally of the distance between limits of movement in the said directions.

8. Apparatus according to claim 7, characterised in that the centring means comprises a V-spring (38) operatively connected between the carrier means (26) and the printing means (14), whereby movement of the carrier means (26) effects compression of the spring (38).

9. Apparatus according to any of the preceding claims, characterised in that the ink retaining means comprises an inked ribbon (16) having three parallel discrete areas holding different coloured inks.

10. Printing apparatus comprising means for supporting material receiving a print-out, and means for printing discrete colours of ink on the print-out, characterised in that means are provided for programming the apparatus to selectively print the discrete colours or the discrete colours sequentially against the same location on the print-out material before the inks supplied to the material dry thereon, whereby one of the discrete colours or a further colour is produced on the print-out material.

FIG.1

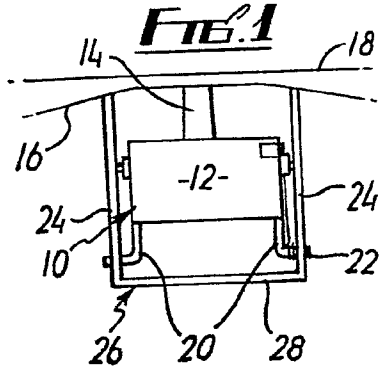


FIG.2

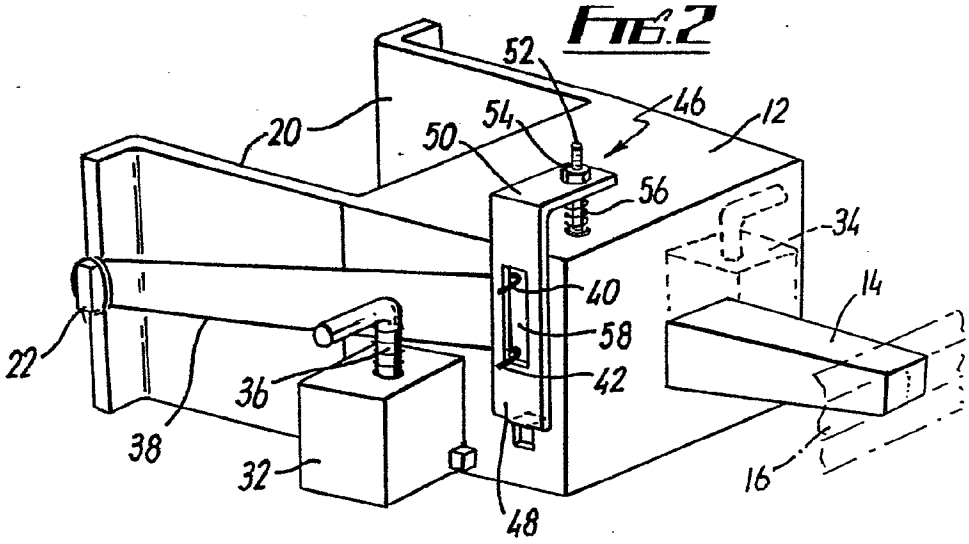
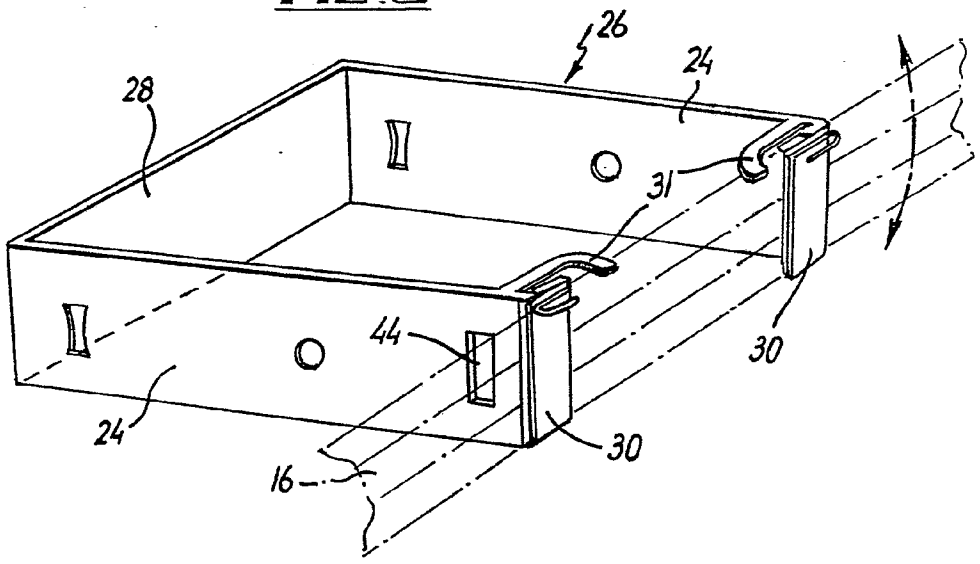


FIG.3



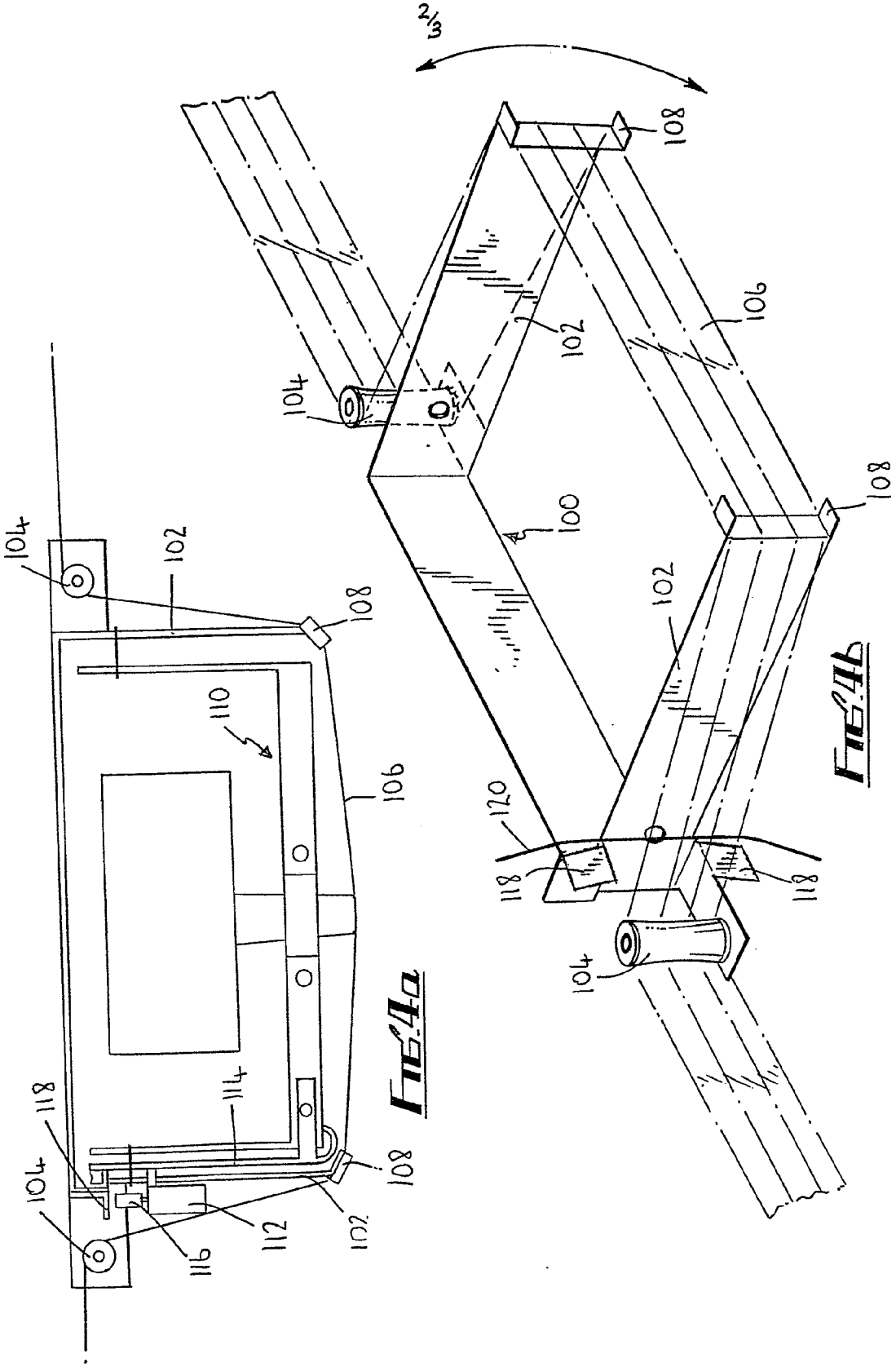


Fig.4a

Fig.4b

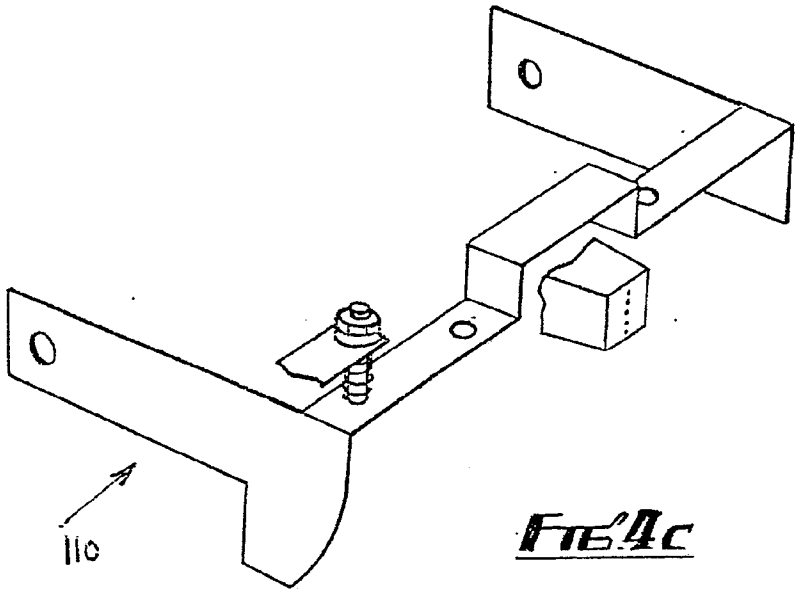


FIG.4c

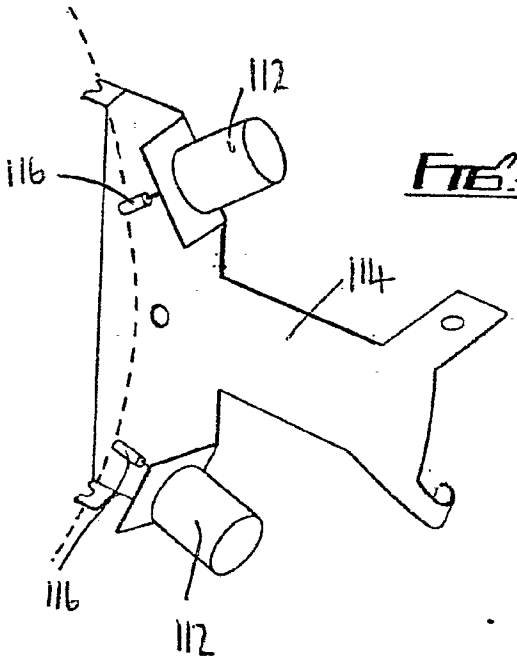


FIG.4d