

[54] **PRINTING DEVICES FOR CALCULATING APPARATUS**

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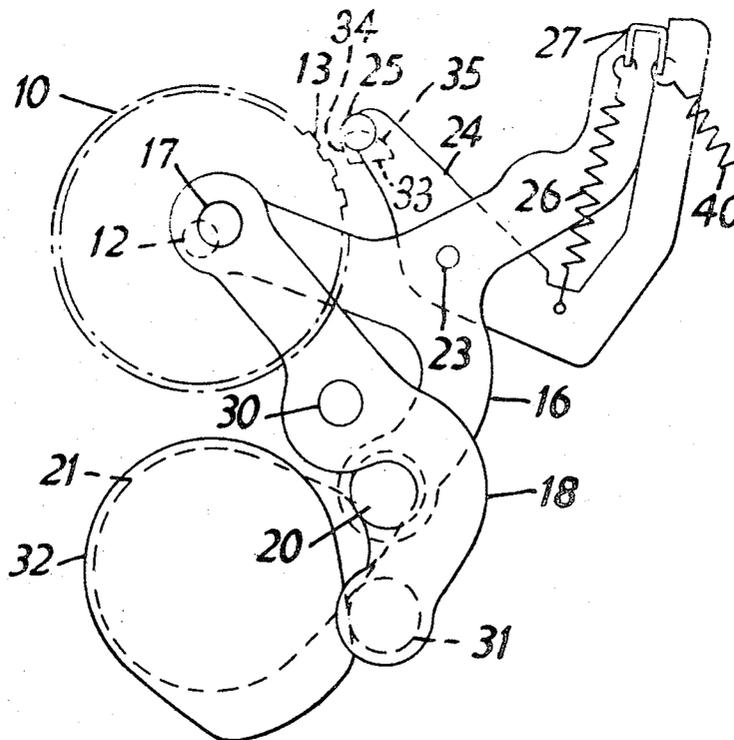
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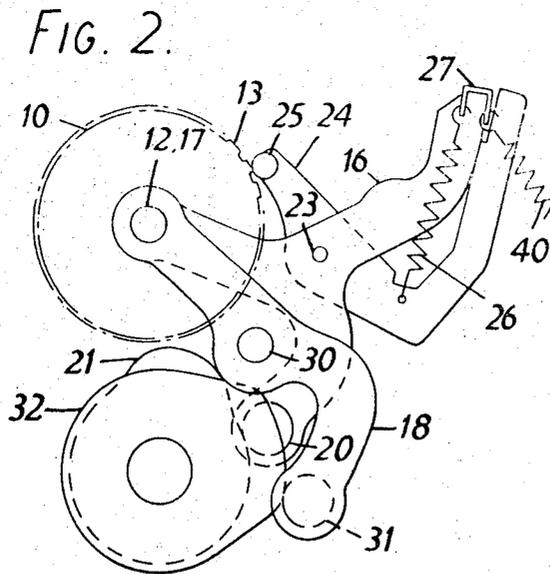
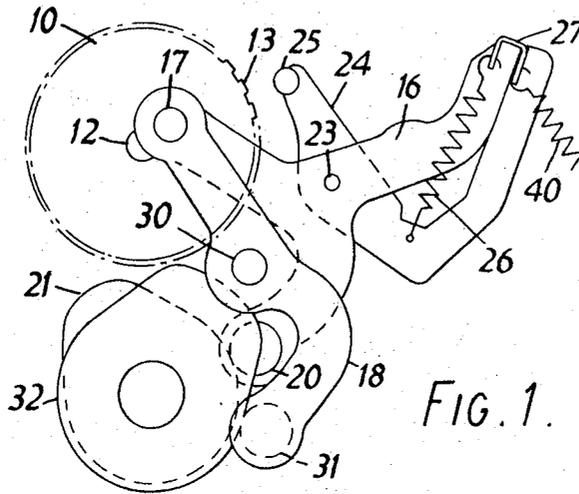
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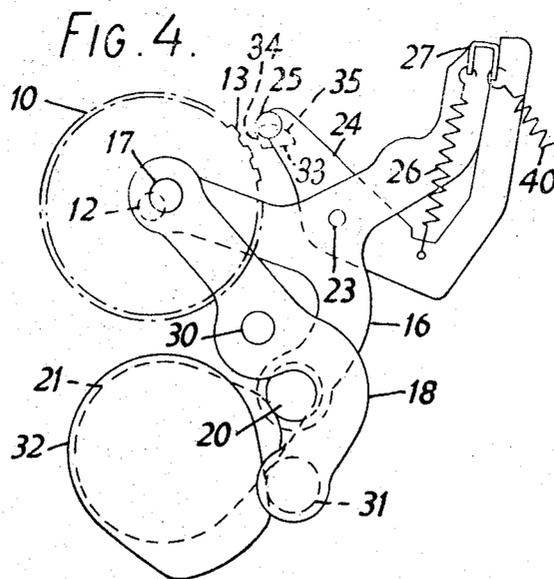
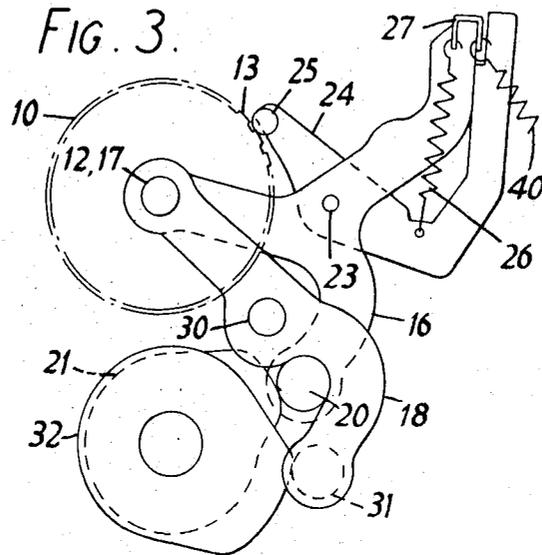
[57] **ABSTRACT**

A printing device comprising a row of printing elements each carrying a plurality of printing characters, a plurality of pressure members for pressing a print medium against the printing elements, and so arranged that each pressure member presses said medium against at least one and not more than three of said printing elements, carrier members carrying said pressure members, each carrier member being associated with at least one and not more than three printing elements, resilient means arranged so as to urge said pressure members independently of each other towards the printing elements, stop means limiting the movement of the carrier members towards the printing elements, and actuating means for moving the carrier member to bring the pressure members to the printing surfaces of the characters until the carrier members move off said stop means and the pressure members are then urged against the printing characters by said resilient means, then moving the pressure members over the characters and finally disengaging the pressure members from the characters.

3 Claims, 6 Drawing Figures







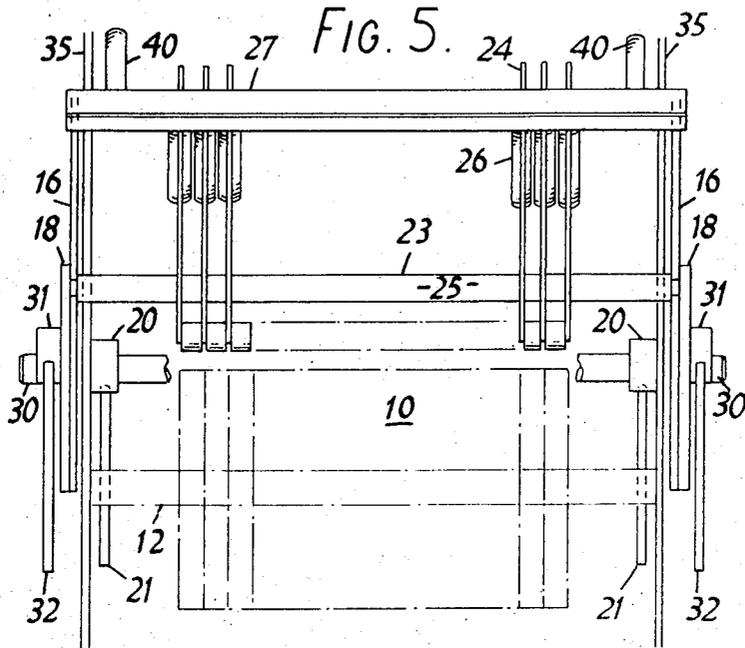
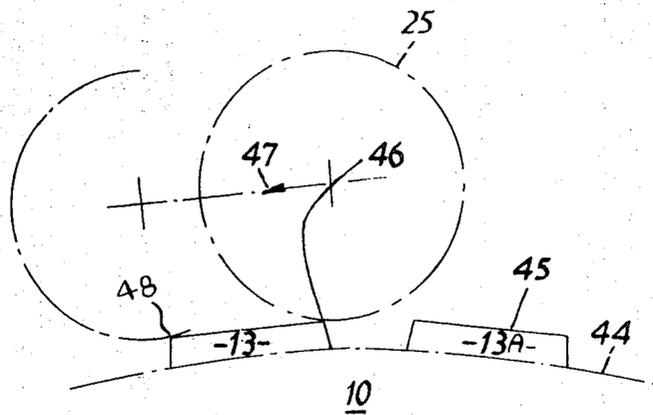


FIG. 6.



PRINTING DEVICES FOR CALCULATING APPARATUS

This invention relates to printing devices, for example for calculating devices such as cash registers, adding machines and desk calculators, of the kind in which a row of printing elements, e.g., wheels, can be moved to bring required numbers or other characters into line whereupon a paper strip or other print medium is pressed against the line of characters. The term "printing elements" is intended to include a rotary member having printing characters over a part only of a circumference.

It is known to project a printing platen at fairly high speed against the paper but this is noisy and tends to produce uneven density of ink impression on the paper from one character to the next.

It is also known to press the paper on to the characters by a resilient pad but while this reduces noise the depth of printing varies with the number of characters being printed which changes from item to item.

The difficulties are aggravated by the fact that the printing wheels may vary slightly in size due to manufacturing tolerances for example when using wheels moulded in synthetic plastics a tolerance of at least one or two thousandths of an inch can be expected on the radius of the wheel (and thus of the printing surfaces of the characters) especially due to uneven shrinkage on removing them from the moulds in which they are made and the tolerance can occur in opposite directions on adjacent wheels.

According to the invention a printing device for a calculating machine comprises a row of printing elements each carrying a plurality of printing characters, a plurality of pressure members for pressing a print medium against the printing elements and so arranged that each pressure member presses said medium against at least one and not more than three of said printing elements, carrier members carrying said pressure members, each carrier member being associated with at least one and not more than three printing elements, resilient means arranged so as to urge said pressure members independently of each other towards the printing elements, stop means limiting the movement of the carrier members towards the printing elements, and actuating means for moving the carrier members to bring the pressure members to the printing surfaces of the characters until the carrier members move off said stop means and the pressure members are then urged against the printing characters by said resilient means, then moving the pressure members over the characters and finally disengaging the pressure members from the characters.

The pressure members may be rollers.

It will be understood that the printing medium, e.g., paper, will be located between the rollers and the printing characters and possibly also an inking ribbon, and any references to contact of the rollers with the printing characters will be intended to include the interposition of printing medium and/or ribbon.

Such an arrangement can be arranged to operate quietly and to produce more uniform ink density on all characters and to allow for variations in size of wheels or characters.

The rollers may be spring urged by spring means towards the printing wheels and may be made of sub-

stantially nonresilient material such as hard synthetic plastics material or metal.

The rollers may be pressed against the printing medium over the printing characters with adequate force of the spring means before commencement of the rolling of the rollers over the characters.

The actuating means may comprise a plurality of first movable support members on which the carrier members are mounted, a plurality of second movable support members on which the first support members are respectively mounted, and cam means for moving the second support members and thereby also the first support members to bring the pressure members to the printing surface, whereupon the first support members are actuated to move the pressure members over the printing characters.

The first support members may be pivotally mounted on an axis which moves approximately into alignment with the axis of the printing wheels to bring the rollers into contact with the characters, whereupon the first support members are swung about said axis to cause the rollers to roll along the characters on the printing wheels.

The first and second support members may be moved by cams and the second members may be moved to bring the rollers towards the printing wheels while the latter are being moved to their required positions. The second members may be moved comparatively slowly so as to contact the characters with little or no noise. The final approach and contact of the rollers with the characters will occur after the printing wheels have been brought to rest.

A constructional form of the invention will now be described by way of example with reference to the accompanying diagrammatic drawings wherein:

FIG. 1 is a side elevation of a printing device made in accordance with the invention;

FIGs. 2, 3 and 4 are similar views but showing the parts in progressive position;

FIG. 5 is a front view of the device; and

FIG. 6 is a detail to be described.

A row of printing wheels such as 10 are mounted rotatably on a common axle 12 and carrying printing characters on their peripheries one of which characters is shown at 13. The axle is carried by a pair of frame plates 35 (FIG. 5) which are fixed together parallel to each other and spaced apart to receive the wheels between them.

Adjacent each frame plate is a system of two levers, viz. a first support member or lever 16 which has three arms, one of which is pivoted at 17 to one end of a second support member or lever 18. The second arm of lever 16 carries an anti-friction roll 20 engaged by a cam 21. The third arms of the two levers 16 carry an axle 23 on which are mounted a series of third levers or carrier member 24 corresponding in number to the printing wheels and each carrying a pressure member in the form of a printing roller 25 at one end. The levers 16, 18 and cams 21, 32 together constitute actuating means for actuating the carrier members 24. Springs 26 are connected to the levers 24 and to a bar 27 which serves as a stop means and is connected to the two levers 16. The springs hold the levers 24 against the bar carried by the two levers 16 with the print rollers 25 urged towards the printing wheels.

The second lever 18 is pivotally mounted on an axle 30 carried by the frame plates and carries an anti-friction roll 31 engaged by a cam 32.

As already mentioned a paper strip (not shown) is between the rollers 25 and the characters so that the line of characters is printed on the paper.

While the printing wheels are being rotated to their required positions to show the indications required by the calculating apparatus, the cam 32 is moving the second lever 18 (FIG. 1) in the direction to bring axle 17 into alignment with axle 12 thereby carrying levers 16, 24 with it. This movement brings the axis of the printing rollers 25 along the line 33 (FIG. 4) so that the rollers 25 touch the printing surfaces of those characters 13 which are aligned for printing (FIG. 2), after the printing wheels have come to rest. When the rollers 25 engage the printing characters, the levers 24 may be moved about their pivot 23 against the action of the springs 26 so that the levers move slightly, e.g., about 10 thousandths of an inch off the bar 27 to allow for manufacturing tolerances in the printing wheels and characters, and to apply adequate spring pressure of the rollers on the paper against the characters. Second cam means i.e. the cams 21 now move the levers 16 about the axle 17 which causes the rollers 25 to roll up over the characters (FIG. 3) so that the axis of the rollers moves along a path 34 (FIG. 4). The cams 21, 32 then allow the levers to retract the rollers 25, e.g., so that the axis of the rollers 25 moves along a return path 35.

The tension of the springs does not change appreciably as the rollers 25 move over the characters and this contributes to even printing. Since each printing wheel is associated with its individual roller and its spring, the printing of the row of characters remains even on all the characters irrespective of the varying number of characters being printed.

A spring 40 is provided to hold the antifriction rolls against the cams.

The pressure members are preferably rollers which may be non-resilient, e.g., steel or other metal but could be merely integral smooth ends of the carrier members, or shoes carried resiliently or rigidly by the carrier members.

Preferably each resilient pressure means acts on a carrier members that carries a pressure member acting on only one printing wheel.

A pressure of about 12 to 16 ounces, e.g., 14 ounces, may be used in order to achieve a good print. If each pressure means applies pressure to two printing wheels it will need to apply a pressure of 28 ounces or for three wheels 42 ounces. For four wheels or more a pressure of 56 ounces, etc., would be required and for the purpose of satisfactory printing this is impractical. In positions of the printing wheel where no printing character is adjacent the printing roller, the latter will not press the printing medium on to the printing wheel and therefore will not make any ink mark on the printing me-

dium.

FIG. 6 is an enlarged view of part of a printing wheel 10 showing two printing characters 13, 13A, and the roller 25 contacting the printing surface of character 13 at 46 before moving in the direction of the arrow 47 to roll over the character to the position 48 whereupon it will be retracted from the printing wheel.

The printing wheels are normally held against rotation in one direction by pawl and ratchet devices and the direction of movement 34 should be in the direction in which the printing wheels are held against movement.

I claim:

1. A printing device comprising a row of printing elements each carrying a plurality of printing characters, a plurality of pressure members for pressing a print medium against the printing elements, and so arranged that each pressure member presses said medium against at least one and not more than three of said printing elements, carrier members carrying said pressure members, each carrier member being associated with at least one and not more than three printing elements, resilient means arranged so as to urge said pressure members independently of each other towards the printing elements, stop means limiting the movement of the carrier members towards the printing elements, a plurality of first movable support members on which the carrier members are mounted, a plurality of second movable support members (18) on which the first support members are respectively mounted, first cam means (32) for moving the second support members and thereby also the first support members to bring the pressure members to the said printing surfaces, whereupon the first support members are actuated by second cam means (21) to move the pressure members over the printing characters.

2. A printing device as claimed in claim 1 having an axle on which the carrier members are pivoted, said axle being carried by the first support members, springs which urge the carrier members towards the printing characters, pivots on the second support members which pivots carry the first support members, and spring means which urge the first support members against their cam means.

3. A printing device as claimed in claim 1 having an axle on which the carrier members are pivoted, said axle being carried by the first support members, springs which urge the carrier members towards the printing characters, pivots on the second support members which pivots carry the first support members, and spring means which urge the first support members against their cam means and wherein the device is so constructed that the axis of the pivot of the first support members on the second support members is moved approximately into coincidence with the axis of the printing elements before the pressure members are moved over the characters.

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