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R. E. STERLING

3,292,533

INK-TRANSFER TYPE PRINT HEAD ADJUSTER

Filed April 21, 1965

FIG. 1

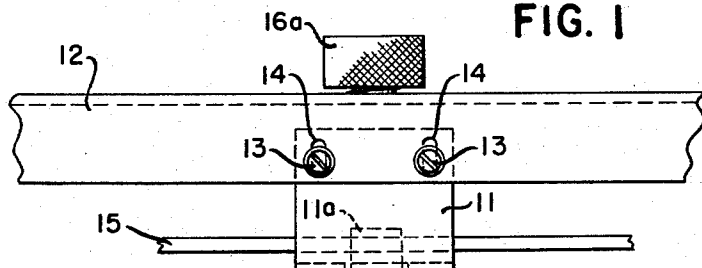


FIG. 6

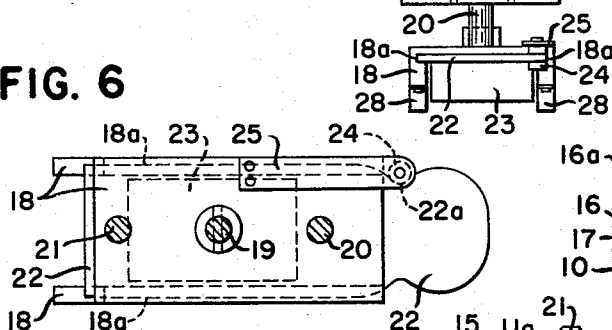


FIG. 2

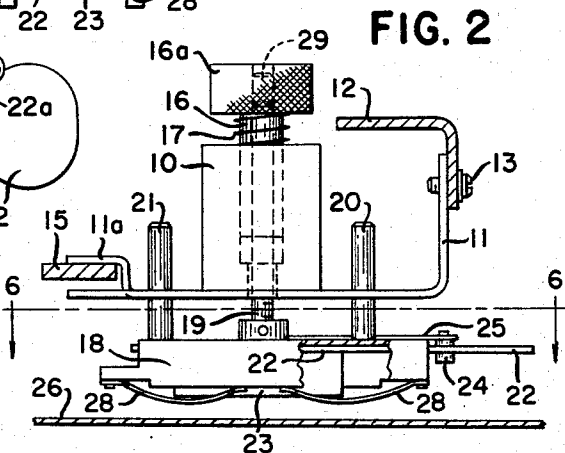


FIG. 5

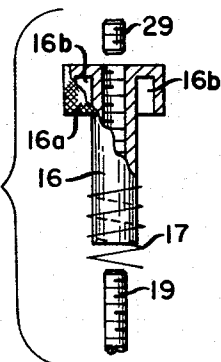


FIG. 4

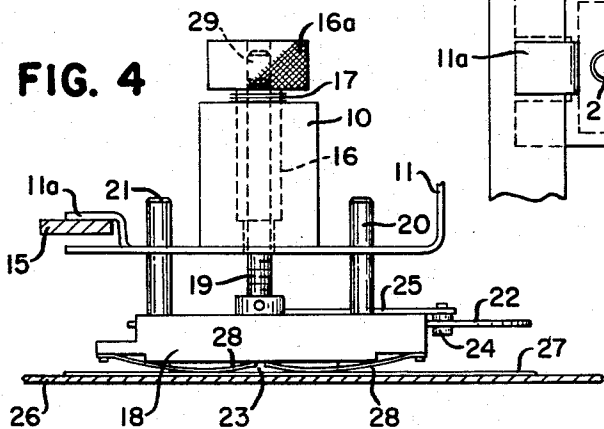
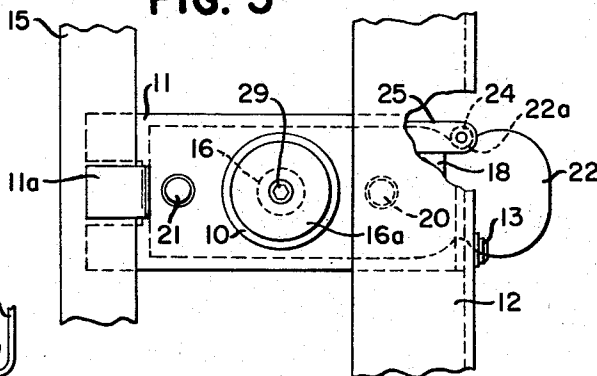


FIG. 3



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INK-TRANSFER TYPE PRINT HEAD ADJUSTER
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The present invention relates generally to improvements in the art of printing, and more particularly to an improved means for adjusting print heads relative to their associated platens or like media-supporting members.

Assuming, as an example and for the sake of the instant disclosure, that a print head of the ink-transfer type is made of either electrotype or porous rubber construction, it is clear that the excellence of any printed record resulting through operation thereof is related in great part to the precise alignment of such print head with respect to the associated platen member. Should the print head be slightly cocked and out of substantial parallelism with the associated platen, the record material supported by the platen will receive an overall print less than complete, or, at best, one varying in darkness from one area to another. While both excessive inking and increased impression force of the print head immediately come to mind as several possible means of solving such an inferior print laydown, a more logical approach would be to initially gain and maintain parallelism or near parallelism between the related print head and its associated record-material-supporting platen member. With this done, uniform printing can be had with minimum effort, with respect to both ink usage and impression force.

While nonparallelism between the print head and the platen is normally due to poor alignment during an initial printer unit setting-up operation, the actual cause thereof at this time is many times itself due to a condition not readily perceivable by the installer—such as in the print head itself being somewhat out of square with the particular support provided therefor. That is, while the precise means for supporting a print head of the above kind might itself be adequately aligned (parallel or near parallel) with the associated platen member, usual tolerance requirements in the manufacture of such a print head are normally wide enough to permit the type face portion thereof to be out of parallel with the previously mentioned in-parallel supporting member. Electrotype mounting blocks, normally of wood construction, of course can vary in thickness from one side to another, as can the porous material providing a mounting for an associated type-carrying plate or face also of a porous or even microporous rubbery material. In either event, electrotype or porous rubber application, the type-carrying portion or surface (printing face) of the particular print head is acceptable in the trade even though it is not precisely square with the rear surface of its mounting member. For this reason, it is clear that "parallelism," as discussed herein, between the print head and the platen is concerned solely with the platen and type face relationship, hence requiring adjustment to the print-head-supporting member corresponding to the tolerance-permitted variance found to exist in each print head employed.

Following the above discussion, the main object of the present invention is directed to the provision of mechanism permitting print head adjustment to a visually determined parallelistic and best printing position relative to the associated record-material-supporting platen member.

Further objects of the invention, as will become apparent from the ensuing description, include means for retaining print head positioning after adjustment, means permitting selection of darkness of the printed record to a desired degree, and means for insuring the darkness selected to be maintained for each printed record applied to a common weight record material.

With these and incidental objects in view, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in appended claims and a preferred form or embodiment of which is hereinafter described with reference to the accompanying drawing.

Of said drawing:

FIG. 1 is a front elevation of the instant invention as embodied in a printer unit of the solenoid-actuated type;

FIG. 2 is a view in side elevation and partial section of the instant invention as so embodied in FIG. 1, and further showing it as normally positioned with respect to an associated platen member;

FIG. 3 is a view in top plan;

FIG. 4 is a further view of the instant invention in side elevation, but showing it as operated from its normal position of FIG. 2 to its printing position with respect to the associated platen member;

FIG. 5 is a schematic representation in partial section of certain of the adjusting elements making up the instant invention; and

FIG. 6 is a view in section taken along the line 6—6 in FIG. 2.

For the present disclosure, the invention is shown employed in a printing unit of the solenoid-actuated type, which in turn is adjustably supported by fixed framework of that type which might be common to any one of numerous business machines. As for the details thereof, the printing unit itself includes a solenoid 10 secured to the upper surface of a mounting plate 11 (FIG. 2). While the mounting plate 11 may be of any desired shape, the essential thing being that it can be adjustably fixed to an associated framework 12 or other fixed portion of the business machine in question, the preferred embodiment herein provides it with an upstanding end portion screw-threadedly carrying a pair of spaced-apart mounting screws 13 extending slidably through aligned slots 14 within the framework 12. As is clear from FIG. 1, such an arrangement permits the mounting plate 11 to be rocked a precise extent relative to the fixed member 12 and then firmly secured with respect thereto whenever desired. The opposite end of the mounting plate 11 is formed in such a manner that a central tab portion 11a can rest against the upper surface of a further framework or like fixed portion 15 of the printing-mechanism-carrying machine in question. Of course, if sufficiently rigid, the mounting plate 11 may be supported in cantilever fashion solely by the fixed member 12; hence eliminating any need for either the mounting plate tab 11a or the additional framework 15.

An internally-threaded armature 16 extends slidably and downwardly within the solenoid 10. As indicated in FIG. 4, the overall length of the armature 16 permits it to bottom within the solenoid 10, leaving a head portion 16a thereof free and clear of solenoid engagement. As illustrated in FIG. 5, the head portion 16a is undercut at 16b for receiving therewithin the upper end of a coil spring 17 surrounding the armature 16, the lower end of which spring 17 abuts the upper surface of the solenoid 10 (see also FIG. 2). With the spring 17 applied to the armature 16, and with the armature 16 entered into the upper end of the solenoid 10, it is clear that a normal positioning of the armature is approximately that illustrated in FIG. 2, where the weight of the spring 17 is sufficient to normally maintain the lowermost end of the armature a spaced distance from its bottoming position within the solenoid 10. Energization of the solenoid 10, of course, overcomes the force of the spring 17 and draws the armature 16 therewithin, to the position where it bottoms within the solenoid (FIG. 4).

Arranged beneath the mounting plate 11 is a print head supporter 18 having a central operating shaft 19 extending upwardly and being threaded throughout so as to be screw-threadedly received within the internally-threaded portion of the solenoid armature 16, and having a pair of spaced-apart aligning pins 20 and 21 likewise extending upwardly and through apertures provided therefor fore and aft along the mounting plate 11. As illustrated in FIGS. 2 and 4, the operating shaft 19 fits freely through aligned openings in both the solenoid 10 and the mounting plate 11, as do the several pins 20 and 21 with respect to their mounting-plate-carried apertures (FIG. 3). The result of this non-sliding fit with respect to both the shaft 19 and the pins 20, 21 is to cause total guidance of the supporter 18 to be dependent upon the fit of the armature 16 within the solenoid 10, with rotational positioning of the supporter 18 relative to the mounting plate 11 being controlled by the several aligning pins 20 and 21.

As best understood from FIGS. 1 and 2, the particular print head supporter 18 hereof is channeled longitudinally, in effect defining an inverted U-shaped member available for receiving an appropriate printing head therewithin. One means for supporting such a printing head is that illustrated, where the opposing inner corners of the supporter 18 are undercut therealong, as at 18a (FIGS. 1 and 6), for slidably receiving the side edges of a print head carrier 22 therewithin. Secured to the under surface of the carrier 22, so as to be integral therewith, is a print head 23 of the type discussed above, being of a width to fit freely between the downturned sides of the supporter 18 (FIGS. 1 and 6), and being of such a thickness as to have its lower, planar printing face extend a substantial distance beyond the lower edges of the supporter sides (FIGS. 2 and 4). While longitudinal positioning of the carrier 22 along the supporter 18 may be by any suitable means, the essential thing being that it is fixedly secured thereto so as to present the interconnected print head 23 approximately centrally below the operating shaft 19, one quick and easy means for so doing is through use of a latch stud 24 engageable with an undercut 22a (FIGS. 3 and 6) provided within the print head carrier 22 proper. For convenience, the stud 24 may be carried by a spring 25 affixed to the supporter 18, in turn biasing said stud 24 so as to automatically engage the carrier undercut zone 22a whenever brought into alignment therewith. The overall print head construction hereof is thus one which permits the carrier 22 to be engaged with supporter undercut zones 18a and manually slid therealong until the spring-loaded latch stud 24 restrains further movement thereof. When this is done (FIGS. 2 and 6), the print head 23 proper is caused to be positioned substantially centrally of the supporter 18, with its type face (lowermost surface) directed toward an associated platen 26.

Operation of a printing unit of the type hereof, it is clear, is through forcing the print head 23 itself either against a piece of media 27 (FIG. 4) supported by the platen 26, or, in the case of an inkless head 23, against an appropriate ink-ribbon or the like provided immediately ahead of the media 27. The media 27, of course, must be restrained against movement at each printing time. For this purpose, the instant mechanism employs a plurality of leaf springs 28 so arranged as to first engage the media 27 and maintain it against the platen 26 throughout the printing operation. As seen in FIGS. 1 and 2, four of these leaf springs 28 are provided, each having one end thereof fixed adjacent a respective corner of the print head supporter 18, with its free end extending inwardly and along the under surface of the supporter adjacent side edge. This overall arrangement, as disclosed in FIGS. 2 and 4, presents the springs 28 in position to be effective for media retention just prior to and during each printing operation, as they are free to normally seek a media-engaging position immediately prior to print laydown and thereafter be deformed to and throughout the completion of the printing operation.

The actual printing operation may, of course, be per-

formed with impression force supplied through mechanical or electrical means. In the instant embodiment, such force is supplied by the solenoid 10, which, when energized, causes the armature 16 to be pulled inwardly from its normal, spring-17-urged, position of FIG. 2 to its solenoid-bottoming position of FIG. 4. This, as is illustrated, moves the retaining springs 28 downwardly and into holding engagement with any media 27 therebelow, followed by contact of the print head 23 with said media (or ink-ribbon, etc.) shortly thereafter.

Whether or not this print head 23 contact is effective to make both an overall and a uniform printed record on the media 27 depends, as above mentioned, upon the precise alignment of the head with the associated platen 26. If a non-parallel relationship exists therebetween, something less than a desirable print laydown results—with, for example, a media-27-contained printed record either lacking total ink fill, or, in an attempt to overcome this, having some zones excessively inked. Print head adjustment relative to the associated platen is thus extremely important for providing the best possible printed record in each instance, in effect enabling any tolerance build-up during print head manufacture to be smoothed out or otherwise compensated for during initial setting-up of the printing mechanism proper.

Considering the instant printing mechanism, any adjustment required includes rocking the mounting plate 11 relative to the fixed framework 12 within the limits available through the screw 13 and slot 14 arrangement, to in fact laterally adjust the print head 23 until its type-carrying face (lowermost surface) lies substantially parallel with the platen therebelow. When such an adjustment is accomplished, tightening of the several screws 13 will, of course, maintain the print head setting. As is clear from FIGS. 1 and 2, the mounting plate tab portion 11a pivots during such print head adjustment on the additional framework 15, thus presenting no obstruction to rocking of the mounting plate 11. Sufficient rigidity will, of course, permit the mounting plate 11 to be supported solely by the framework 12, the tab portion 11a and associated further framework 15 not needing to be considered in the overall assemblage presented. On the other hand, appropriate adjusting means between the members 11a and 15 could permit a further and longitudinal setting of the print head 23 relative to its associated platen 26, through a precise raising or lowering of the tab portion 11a as required for gaining the parallelism desired.

Considering the overall printer unit mechanism herein illustrated and described—one which facilitates lateral adjustment of the print head 23 relative to the platen therebelow—each new print head 23 is first positioned within the supporter 18 by springing the latch stud 24 upwardly that extent which permits the print head carrier 22 to be slid inwardly and along the undercuts 18a. When fully entered within the supporter 18, with the print head 23 positioned substantially centrally of the operating shaft 19 (FIG. 2), action of the spring 25 is sufficient to return the latch stud 24 to normal and within the then-aligned undercut area 22a of the carrier 22 (as illustrated in FIGS. 3 and 6). The print head 23 itself is now fixed relative to the associated operating shaft 19, which itself is screw-threadedly carried by the shiftable armature 16. With this done, the print head 23 is now ready for final adjustment relative to the platen 26 therebelow, as to both its printing alignment therewith and extent of ink transfer (printing darkness) to the record material 27 supported thereby.

As described previously, the coil spring 17 yieldingly urges the armature 16 to the position of FIG. 2, with the interconnected print head supporter 18 thereby presented a precise distance above the associated platen 26. Energization of the solenoid 10 overcomes the force of the spring 17 and bottoms the armature 16, as seen in FIG. 4, where the print head 23, carried by the supporter 18, becomes impressed against the platen-sup-

ported piece of media 27. With this overall operation in mind, printing mechanism set-up for accomplishing the instant objects of visually-determined parallelism and print-record darkness control can quickly and easily be performed in the following manner.

After the print head carrier 22 is inserted within the supporter 18, as above described (FIGS. 2 and 6), clockwise rotation of the armature head portion 16a causes the central operating shaft 19 to move inwardly within the armature 16, in turn moving the interconnected print head supporter 18 upwardly and away from the associated platen 26. Knowing the approximate length of travel of the armature 16 before it bottoms in the solenoid 10 permits, as is clear from FIG. 2, a preliminary setting, whereby the type surface (lowermost edge) of the print head 23 falls just short of making contact with a representative piece of media 27 therebelow during operation of the actuating solenoid 10. That is, while energization of the solenoid 10 is effective to move the supporter 18 downwardly, prior adjustment thereof through rotation of the armature 16 presents the print head 23 a distance above the platen 26 exceeding the available travel of the armature 16 within its solenoid 10. At this point, it is worth noting that a similar condition could exist through restricting the travel of the armature 16 within the solenoid 10, which would be done if a positive upper stop were provided on the supporter 18, so as to compress the coil spring 17 when once the uppermost limit (for example, the positive upper stop engaging the under surface of the mounting plate 11) of the supported 18 has been reached. While the overall effects would be the same, this latter approach, it is clear, effectively lessens the extent of permitted movement of the armature 16 within the solenoid 10 rather than, as in the illustrated embodiment, effectively increasing the distance of travel required by the print head supporter 18. In each instance, print head 23 travel through energization of the solenoid 10 is something less than that required to contact any media 27 supported by the platen 26 therebelow.

With the print head 23 so adjusted to this preliminary, "non-printing" position, small increments of reverse rotation (counterclockwise) of the armature 16 are then undertaken until energization of the solenoid 10 causes a test piece of media 27 therebelow to first receive ink transfer from or by the print head 23 in question. Absent the print head 23 for one reason or another having its type face substantially aligned with the platen 26, it is clear that this first-noticed ink transfer will be but a partial print only, normally including a corner zone or perhaps a side portion only of the overall record desired to be printed on pieces of media 27. In view of the precise location and extent of this first printed record being received by the test media, fairly accurate judgment can now be made as to the direction and extent of rocking required of the mounting plate 11 to more accurately align the printing head 23 parallel. When once the mounting plate movement considered to improve the printed record has been completed, return of the several screws 13 to a tightened condition effectively maintains the new setting. The solenoid 10 is again energized to determine the new results on the test media 27, with perhaps a second energization following after the armature 16 has been further backed up slightly so as to somewhat darken the overall ink transfer then taking place. With the new printed record now available for inspection on the test media 27, a repeat performance of this adjusting procedure just mentioned could and would follow until the test printing operation shows a printed record substantially filled throughout and with fairly equal ink consistency while so doing. This "best possible" adjustment of the print head 23 might take from, for example, one to five different settings of the mounting plate 11, with each movement thereof being somewhat less than that preceding as the precise

setting is so dictated by the location and extent of ink transfer during each of the advancing printing tests.

The final setting of the print head 23 is, of course, reached when a fairly uniform printed record appears consistently on pieces of media 27. When accomplished, with the screws 13 firmly retaining it, additional adjustment of the armature 16 effectively increases or decreases the darkness of the printed record to be applied, all in accordance with the desires of the machine user. If a darker record is specified, the armature 16 can be rotated further reversely until the desired darkness is reached. When this is done, a set screw 29 may be used to retain the final rotational positioning of the armature 16. As understood from FIGS. 2 and 5, this set screw 29 is received within the upper end of the armature 16 and screwed downwardly therewithin until it abuts against the upper end of the central operating shaft 19. Changing the darkness of the printed record or maintaining it approximately uniform by means of increased printing pressure as the print head ink supply or associated ribbon begins to fade may, of course, be quickly and conveniently accomplished through loosening of the set screw 29, turning of the armature 16 the desired extent, and then again tightening of the set screw 29 so as to retain the armature member new setting.

In the case of porous rubber construction, a reserve print head 23 is normally maintained on hand for exchange with another after a specified number of printing operations have been completed. With the instant invention made available to such a machine user, it is clear that the several daily set-up operations required of the printing mechanism employed become minor and quickly-solved problems.

Although the present invention is herein disclosed for use with a printing mechanism of the solenoid-actuated type, it is axiomatic that the invention can easily be embodied in various other printing mechanisms of both electrical and mechanical operation, all without departing from the spirit of the present disclosure. It is thus to be understood that the scope of the instant invention is not to be limited beyond that which may be imposed by the following claims.

What is claimed is:

1. A print head adjuster for use with a business machine having a platen member and an associated printer unit supporting framework, comprising a print head mounting plate; means for adjusting rockably and fixing said mounting plate with respect to said supporting framework; a print head supported shiftably by said mounting plate for movement toward and away from said platen member; a solenoid member carried by said mounting plate; a shaft element extending from said print head and received within said solenoid member; an armature for said solenoid member screw-threadedly receiving said shaft element and effective for actuating said element that extent to move the print head toward and into printing engagement with respect to said platen member; and spring means urging said armature to a normal position relative to the solenoid member, whereby each setting of said armature screw-threadedly along the shaft element is effective to change the spacing between said print head and the associated platen member so as to permit print head alignment with the platen member through mounting plate adjustment as visually determined by the printed record completed upon the printing engagement being first reached.

2. In combination with a business machine having a record material supporting platen and an associated printer unit carrying framework, an adjuster for aligning each print head employed in the printer unit to the best printing position with respect to said platen, comprising a printer unit mounting plate adjustable rockably on said framework; a print head supporter shiftably carried by said mounting plate for movement toward and away from

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said platen; a print head removably carried by said supporter and directed toward said platen; an electromagnet carried by said mounting plate and effective, when energized, for shifting said supporter that distance toward said platen where the print head thereof comes into printing contact with each record material supported thereby; and a core member screw-threadedly interconnected to said print head supporter and thereby selectively settable to different operating extents within said electromagnet for limiting supporter shifting by said electromagnet to selected increments enabling, through mounting plate adjustment on said framework, realignment of said print head with said platen member when determined necessary by visual inspection of the printed record made upon initial contact by said print head with the platen supported record material.

3. In combination with a business machine having a record material supporting platen and an associated printer unit carrying framework, an adjuster for aligning each print head employed in the printer unit to the best printing position with respect to said platen, comprising a printer unit mounting plate adjustable rockably on said framework; a print head supporter shiftably carried by said mounting plate for movement toward and away from said platen; a print head removably carried by said supporter and directed toward said platen; an electromagnet carried by said mounting plate and effective,

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when energized, for shifting said supporter that distance toward said platen where the print head thereof comes into printing contact with each record material supported thereby; a threaded shaft interconnected to said supporter and extending freely within said electromagnet; and a core member for said electromagnet adapted for screw-threaded adjustment along said shaft for limiting supporter shifting by said electromagnet to selected increments enabling, through mounting plate adjustment on said framework, realignment of said print head with said platen member when determined necessary by visual inspection of the printed record made upon initial contact by said print head with the platen supported record material.

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