Sept. 5, 1967 T. H. TOEPPEN 3,339,696

PAPER BAIL STRUCTURE FOR TYPEWRITERS AND THE LIKE

Filed July 12, 1965 3 Sheets-Sheet 1

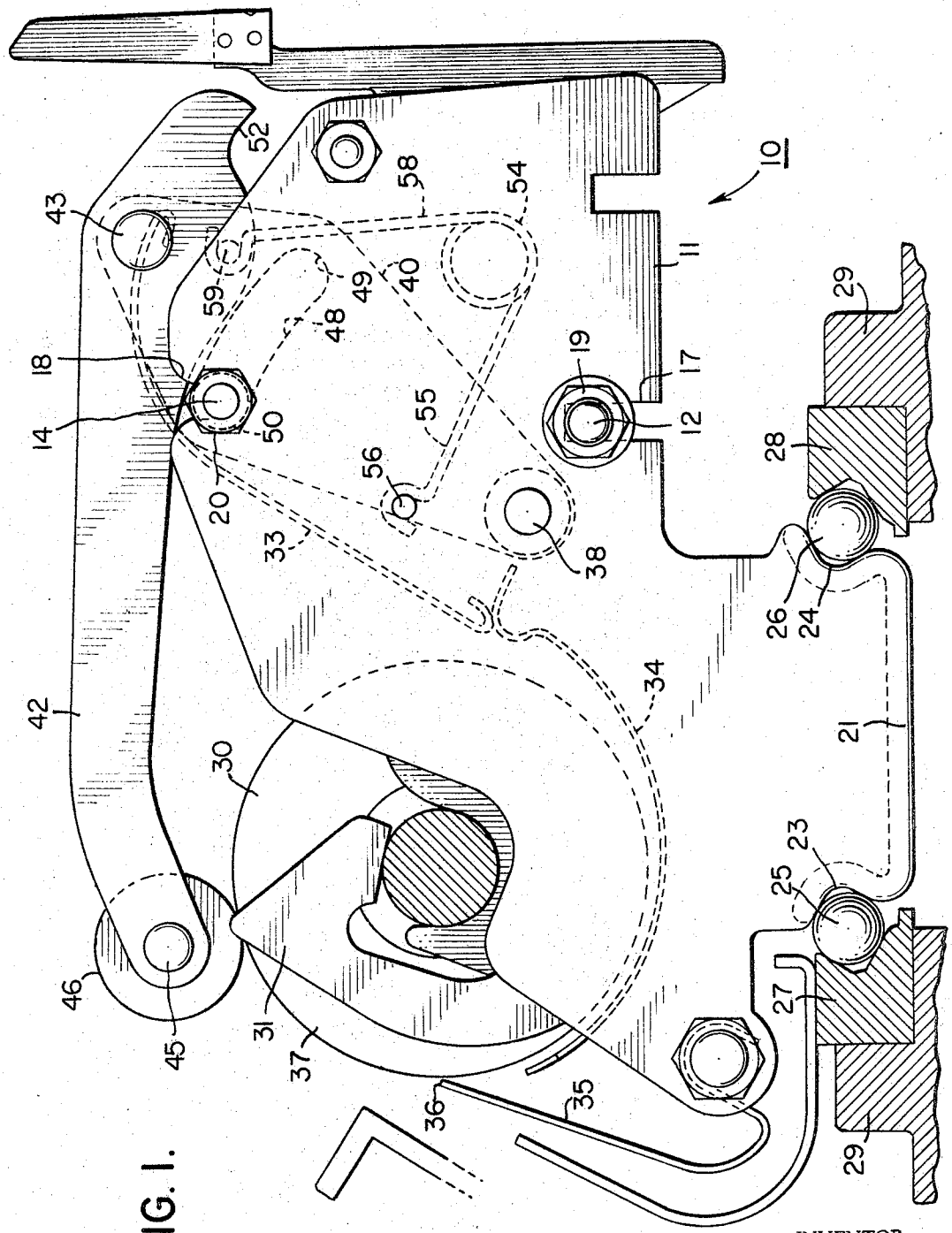


FIG. 1.

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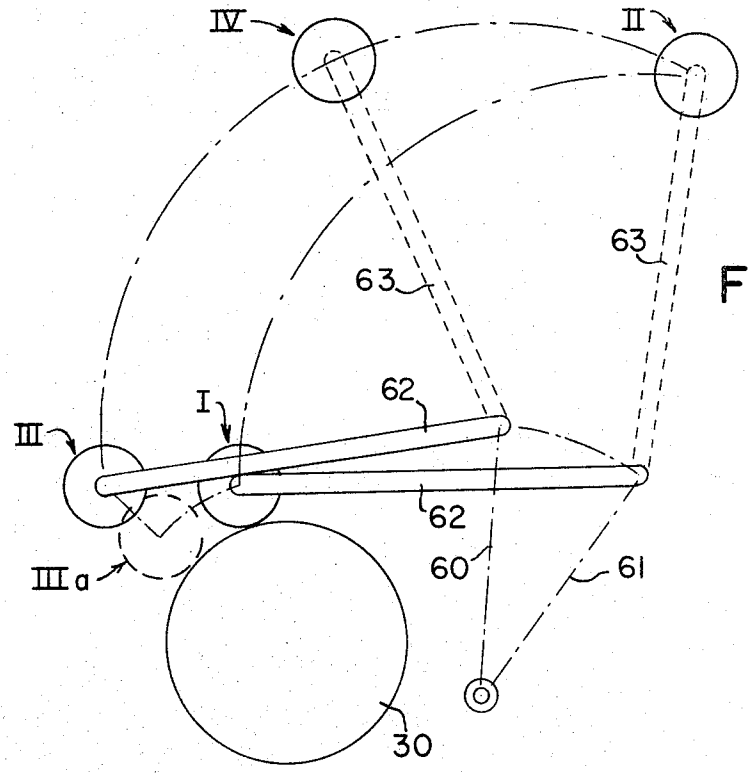


FIG. 2.

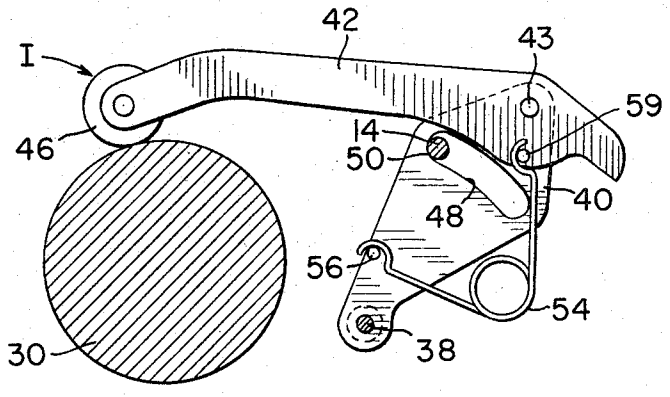


FIG. 3.

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PAPER BAIL STRUCTURE FOR TYPEWRITERS AND THE LIKE

Filed July 12, 1965 3 Sheets-Sheet 3

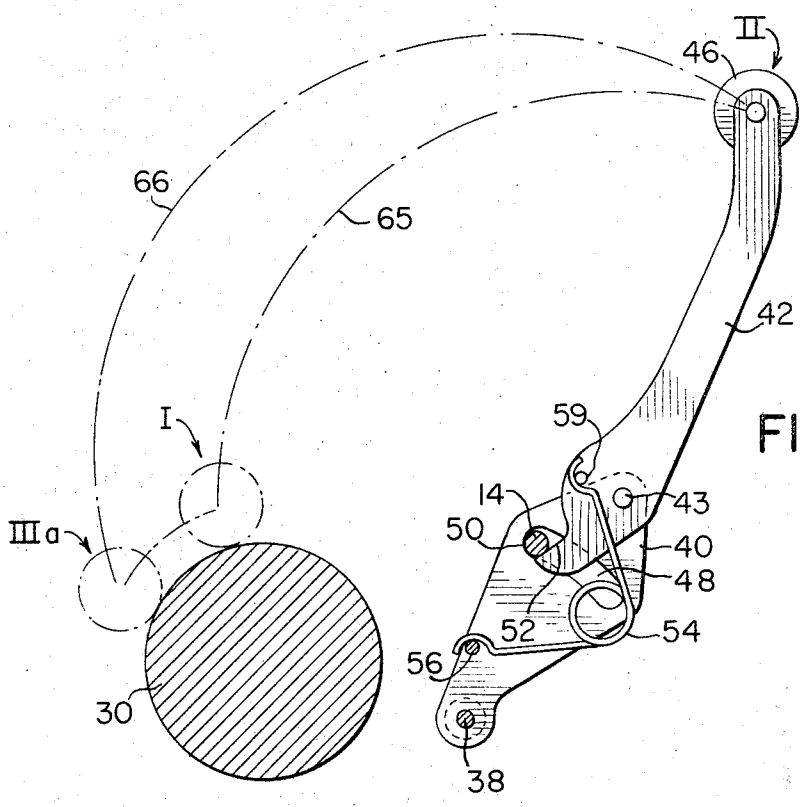


FIG. 4.

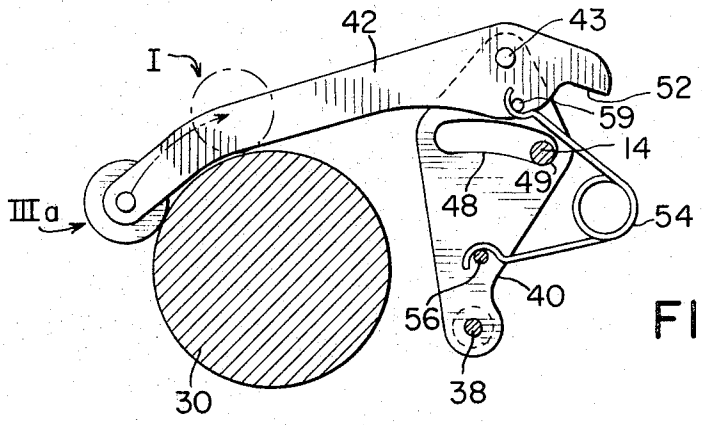


FIG. 5.

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3,339,696

PAPER BAIL STRUCTURE FOR TYPEWRITERS AND THE LIKE

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Filed July 12, 1965, Ser. No. 471,087
4 Claims. (Cl. 197—138)

This invention relates to paper bails for typewriters.

It is to be understood that the term "typewriters" as used herein includes conventional typewriters and other forms of office and business machines for imprinting characters of a work sheet of paper or the like, wherein the work sheet to be printed is guided around a platen into the printing position. A typewriter as thus defined is usually provided with a paper bail arranged to press the work sheet firmly against the platen at a locality above the printing line and thereby, in cooperation with other structures below the printing line, to maintain the work sheet in smooth continuous engagement with the platen at the point where it is struck by the type. The paper bail structure ordinarily includes a bar extending in a direction parallel to the platen axis and bearing a plurality of rotatable rollers for engaging the work sheet. To facilitate feeding of the work sheet into the machine, and also to afford convenient access to the work sheet at the printing line for the purpose of making erasures or corrections, the paper bail is desirably movable between its platen-engaging or operating position and one or more other positions in which the bar and rollers are spaced away from the work sheet.

In some known forms of paper bail structures, the roller-carrying bar is supported by a pair of plain, pivoted arms arranged to swing the bail between its operating position and a clearance position in which the bail is disposed above and rearwardly of the platen, spring pressures being applied to the arms to hold the bail in either of these positions. Such bail structures are simple in construction and operation but provide only a single motion path between the two positions, so that in returning from the clearance to the operating position the bail necessarily approaches the platen and work sheet in a downward direction and as a result often tends to cause buckling of the work sheet at the printing line.

To obviate this difficulty, in other forms of paper bails as heretofore used different or alternative clearance positions have been provided, usually by means of some articulated arrangement of the bail-supporting arms. In particular, these so-called multiposition paper bails commonly provide an additional forward clearance position in which the bail is suspended ahead of and in spaced relation to the platen. From the latter clearance position, the bail returns to the platen along a rearwardly directed path, rather than a downwardly directed path; the rearward direction of motion tends to smooth the work sheet rather than to buckle it as the bail engages the paper. Multiposition paper bails are also advantageous in providing some option as to the motion path followed by the bail, to accommodate the convenience and preference of the operator. Thus, a typical multiposition bail may be moved from operating position to the normal clearance position (above and behind the platen) and back either along a direct path as in the case of a simple two-position bail or along an alternate path through the aforementioned forward clearance position.

However, multiposition paper bails as previously known tend to be structurally complex and also very commonly do not afford the desired smoothness of operation, owing in particular to the multiplicity of spring biasing, detent forces, and guiding surfaces that must be provided to maintain the bail in each of the desired plurality of positions. For example, as the bail is moved from normal clearance position to the forward clearance position or to operating position it may tend to jump between the alternate paths provided; again, movement of the bail from the forward clearance position to the operating position may be accompanied by an undesirable snapping or jerking motion.

An object of the present invention is to provide a new and improved form of multiposition paper bail of advantageously simplified construction.

A further object is to provide such multiposition paper bail, affording a selection of motion paths between clearance position and operating position, which is particularly arranged to enable the bail to approach the platen in an upward and rearward direction so as to prevent buckling of the work sheet and indeed to provide positive smoothing action for assured firm, continuous engagement of the work sheet with the platen.

Further objects and advantages of the invention will be apparent from the detailed description hereinbelow set forth, together with the accompanying drawings, wherein:

FIG. 1 is an elevational view of the right-hand end of a typewriter carriage which includes a paper bail structure embodying the present invention in a particular form;

FIG. 2 is a diagram illustrating the positions and motion paths of multiposition paper bail structures as viewed from the right-hand end of a typewriter carriage, for reference in explaining the arrangement and operation of the paper bail of the present invention;

FIG. 3 is a somewhat simplified elevational view of the right-hand end of the paper bail structure of FIG. 1 in operating position;

FIG. 4 is a like view of the paper bail structure of FIG. 1 in clearance position; and

FIG. 5 is a like view of the paper bail structure of FIG. 1 illustrating one mode of return of the bail from clearance position to operating position.

Referring first to FIG. 1, there is shown in right-hand end view a typewriter carriage **10** including a right-hand side plate **11** which is secured in spaced parallel relation to a left-hand side plate (not shown) by frame structure including tie rods **12**, **14** to provide a rigid carriage frame. The tie rods are received in slots **17**, **18** of side plate **11** and are held in place by hexagonal nuts **19**, **20**. The carriage frame also includes a channel-shaped member **21** extending between and rigidly secured to the side plates; member **21** has sides formed as grooves **23**, **24** to retain bearings **25**, **26** by means of which the carriage is mounted on guide rails **27**, **28** of the typewriter base frame **29** for transverse movement relative to the base frame in typing operation.

A cylindrical platen **30** of rubber or the like, extending between the carriage side plates, is rotatably mounted in the carriage by means indicated at **31**. A sloping paper table **33** is disposed in the carriage behind the platen to facilitate feeding of paper into the machine from the rear of the platen. To guide the paper beneath the platen, there is provided a curved paper deflecting plate **34** positioned

immediately below the platen. A further guide member **35**, also mounted in the carriage with an edge **36** disposed in closely proximate relation to the platen at a locality above and ahead of the leading edge of deflecting plate **34**, directs the paper upwardly around the front of the platen into the printing locality **37** where the paper is struck by the type, and presses the paper closely against the platen immediately below the printing locality.

It will be appreciated that the illustrated carriage frame and platen are generally conventional structures and function in the known manner of such devices in typing operation. Thus the work sheet to be printed is fed downwardly at the rear of the platen and advanced forwardly and upwardly around the platen into typing position by rotational movement of the platen in a clockwise direction as seen in FIG. 1. Thereafter as typing proceeds the paper is successively advanced upwardly past the typing line by further clockwise rotation of the platen.

As incorporated in the carriage **10**, the paper bail structure of the present invention is adapted to press the paper against the platen at a locality above the printing position **37**, thereby (in cooperation with guide member **35**) to hold the paper in smooth continuous engagement with the platen at such printing locality, the bail structure further being movable away from its operating or platen-engaging position for ease of access to the paper at the typing line and to facilitate feeding of paper to the machine.

The bail structure, in its illustrated embodiment, includes a torque shaft **38** journalled for rotation about its axis in the carriage frame **10** rearwardly of the platen and in axially parallel relation to the platen. A torque arm **40** is fixedly secured at its lower end to shaft **38** adjacent to the right-hand end of the platen for rotational movement with the latter shaft and extends generally upward therefrom; a corresponding torque arm (not shown) is secured in the same manner to the torque shaft adjacent the left-hand end of the platen. These two torque arms are thus pivotally movable about the torque shaft axis, forwardly and rearwardly relative to the platen in parallel planes of rotation perpendicular to the platen axis, being kept in phase with each other during such movement by the torque shaft to which they are secured.

A bail arm **42** is secured to the upper end of torque arm **40** by means of a pivot **43** and extends forwardly from this pivot in transverse relation to the platen axis; a second and corresponding bail arm (not shown) is mounted in like manner to the left-hand torque arm referred to above. Secured to and extending between the forward ends of the bail arms, in axially parallel relation to the platen, is a bail member comprising a rod **45** bearing a plurality of rotatable rollers **46**. The joints between the bail arms **42** and rod **45** are loose to allow the bail to adapt itself accurately to the platen. As will be apparent, angular displacement of the bail arms about the pivots connecting them to the torque arms carries the bail member into and away from a position in which the rollers **46** engage the platen **30** for holding the work sheet in the aforementioned manner. This angular displacement of the bail arms is generally upward and downward relative to the torque arms and platen, the bail arms moving in parallel planes of rotation perpendicular to the platen axis.

Torque arm **40** has an arcuate slot **48** extending forwardly and rearwardly (that is, in the direction of pivotal movement of the torque arm being limited by engagement torque shaft **38** and pivot **43**. Tie rod **14** of the carriage frame structure extends through the slot **48** and acts as a stop for the torque arm, forward and rearward pivotal movement of the torque arm being limited by engagement of rod **14** with the rearward end **49** and forward end **50**, respectively, of slot **48**. The tie rod **14** also extends through a similar slot (not shown) provided in the left-hand torque arm of the bail structure. Bail arm **42** (as likewise the corresponding left-hand bail arm) bears a finger-like projection **52** extending rearwardly from pivot **43**; this projection **52** swings down as the bail arm **42** is rotated upwardly and rearwardly from the operating position shown in FIG. 1, so that when the bail arm is in a generally upward position the said projection, and that on the left-hand bail arm, engage tie rod **14** to arrest further upward rotation of the bail arms.

The bail structure of the invention further includes a torsion spring **54** having a lower arm **55** which bears against a pin **56** secured to the right-hand carriage frame plate **11** at a locality below bail arm **42**, and an upper arm **58** which bears against a pin **59** secured to and carried by bail arm **42** in adjacent but eccentric relation to pivot **43**. Spring **54** is in a state of continuous compression between pins **56** and **59** and thus exerts outward forces against these pins in a generally vertical plane transverse to the platen axis. As shown, spring **54** open rearwardly and upwardly from pin **56** so that the force it exerts against pin **59** has at all times a net rearward component.

The bail structure thus provided is a multiposition paper bail in which the bail member may be moved betweeen the operating position of FIG. 1 and a plurality of other positions along a variety of motion paths at the option of the operator. In such multiposition paper bails, the provision of torque arms carried by a torque shaft for in-phase pivotal movement relative to the carriage frame, and bail arms pivoted to the torque arms for carrying the paper bail member, is broadly conventional, the particular features of the present invention residing in the arrangements of spring biasing means and stop means herein provided. For an understanding of the arrangement and operation of the spring forces and stop locations in the present bail structure, reference may be made to FIG. 2 which illustrates diagrammatically the various motion paths and detent positions provided in conventional multiposition paper bails.

These positions and motion paths are determined by the pivotal movement of the torque arms relative to the carriage frame and of the bail arms relative to the torque arms. In FIG. 2, line **60** represents the forward limiting position of torque arm movement relative to the carriage frame and line **61** represents the rearward limiting position of torque arm movement; **62** represents the downward limiting position of bail arm movement relative to the torque arm and **63** represents the upward limiting position of bail arm movement, as found in a conventional multiposition paper bail. The combination of downward and upward limiting positions of the bail arms and rearward and forward limiting positions of the torque arms provides four possible stop or detent locations as indicated, at I, II, III and IV in FIG. 2. Of these, the three positions commonly utilized in multiposition paper bails are the operating position (I), normal or rearward clearance position (II), and forward clearance position (III). In the operating position (I), in which the bail rollers engage platen **30**, the torque arms are at their rearward limiting position and the bail arms are at their downward limiting position. From position I the bail may be moved to the normal clearance position (II), wherein the bail is disposed upwardly and rearwardly of the platen, by rotation of the bail arms to their upward limit **63** while the torque arms remain at their rearward limit **61**. To reach the forward clearance position (III), in which the bail is suspended ahead of and in spaced relation to the platen, the torque arm is moved to its forward limit **60** and the bail arm to its downward limit **62** passing through an intermediate position (IV) wherein the torque arm is at its forward limit **60** and the bail arm at its upward limit **63**. Movement of the bail between these several positions can occur through a variety of paths, one such path being indicated between positions I and II in FIG. 2 and another being indicated between positions II and III passing through position IV, with the bail returning to position I from position III.

Referring again to the paper bail structure of FIG. 1, in FIG. 3 this bail is shown in the operating position I

in which the rollers **46** engage platen **30**. In this position, torque arm **40** is at the rearward limit of its pivotal path, tie rod **14** engaging the forward end **50** of slot **48** to arrest torque arm **40** against further rearward displacement. Bail arm **42** is in a downward position relative to torque arm **40**, being restrained against further downward rotation by the engagement of rollers **46** with platen **30**.

When the bail is in the operating position, the eccentric pin **59** carried by bail arm **42** is disposed generally below pin **43**, so that the torsion spring **54** (which exerts a net rearward component of force on pin **59**) urges or biases bail arm **42** downwardly (that is, for counterclockwise rotation about pivot **43** as seen in FIG. 3), so as to hold the rollers **46** in maintained engagement with platen **30**. The rearward force exerted by spring **54** against pin **59** is also transmitted through the bail arm **42** and pivot **43** to the torque arm **40**; this force biases torque arm **40** rearwardly (for clockwise rotation as seen in FIG. 3) so as to press the forward end **50** of slot **48** against tie rod **14** and thereby to maintain torque arm **40** in its rearward limiting position.

The bail is moved from the operating position to the normal clearance position II, in which the bail member is disposed upwardly and rearwardly of the platen, by manual clockwise rotation of the bail and bail arms relative to the torque arms. This rotation continues, carrying the bail member upwardly away from the platen, until projection **52** of bail arm **42** swings downwardly and forwardly to engage the tie rod **14** and thus to arrest further upward rotation of the bail, as shown in FIG. 4. Such rotation of the bail arm carries pin **59** around to a position in which it is above and ahead of pivot **43**; as a result, when the bail reaches position II the force of spring **54** on pin **59** biases the bail arm **42** for upward or clockwise rotation. That is to say, in this clearance position the bail arm is biased in a direction opposite to that provided when the bail arm is in operating position so that projection **52** is forced against the tie rod **14** to hold the bail in the clearance position. However, the force of the spring on pin **59** as transmitted to torque arm **40** through pivot **43** still biases torque arm **40** for rearward or clockwise rotation and thereby maintains the torque art at its rearward limiting position with the forward end **50** of slot **48** engaging the tie rod **14**.

It will be appreciated that positions I and II of the present paper bail structure as described above correspond respectively to the like-designated positions of conventional multiposition paper bails shown in FIG. 2, the spring biasing forces and stop arrangements of the structure cooperating to retain the bail in each of these positions when the bail is moved thereto.

From position II the bail structure of the invention may be returned to the operating position I through a variety of motion paths at the choice of the operator. By lowering the bail with a slight pressure to the rear, the operator can return it directly to position I along the path indicated at **65** in FIG. 4. If, however, the bail is lowered with a slight pull to the front, torque arm **40** will swing forward and the bail will follow the path indicated at **66** in FIG. 4. Since projection **52** of the bail arm **42** engages tie rod **14** in position II, it will be apparent that as the bail is moved along the path **66** forward rotation of torque arm **40** is limited by the gradual retraction of projection **52** relative to tie rod **14** until the latter projection swings entirely clear of the tie rod; this gradual retraction assures a smooth transition of torque arm **40** to its forward position.

If the outer path **66** is followed to its lowest point, the bail reaches a position designated III*a* in which the rollers **46** engage the platen **30** but at a locality ahead of and below the locality of engagement when the bail is in operating position I. As the bail approaches position III*a* pin **59** again moves to a location (relative to pivot **43**) in which the force of spring **54** urges bail arm **42** downwardly or counterclockwise as seen in FIG. 5, thus forcing the rollers against the platen **30**. In position III*a*, the torque arm **40** is at its forward limiting position at which tie rod **14** engages the rear end **49** of slot **48**. However, the force of spring **54** transmitted through pivot **43** still biases torque arm **40** for clockwise rotation, urging the torque arm toward its rearward limiting position, so that the bail tends to return to the operating position I unless restrained by the operator.

That is to say, in the present bail structure the conventional detented forward clearance position (III in Fig. 2) is eliminated, the bail rollers being engageable with the platen (by downward pivotal movement of the bail arms) at all positions of the torque arms rather than only near the rearward position of the torque arms as in conventional structures, so that the forward-and-downward limit of bail movement is the described position III*a*; as there is no detent or stop of the bail at a forward clearance position, the bail moves smoothly and continuously down from its rearward clearance position into contact with the platen as at position III*a*. In practice the operator will not ordinarily pull the bail down all the way to position III*a*, since the purpose in following this path of return to the operating position is simply to enable the bail to approach the operating position along an upward and rearward path effective to smooth the paper against the platen. Thus, the bail may initially engage the platen at a locality intermediate positions III*a* and I and may then be permitted to move smoothly up to position I, in response to the described spring forces, by gradual release of the bail.

It will now be appreciated that in the operation of the paper bail structure of the invention, the bias applied to the torque arm **40** is always rearward (clockwise) while the bias applied to the bail arm **42** is downward or upward (counterclockwise or clockwise) depending on whether the bail member is in platen-engaging position or in its upward, clearance position, for maintaining the bail arms in either of these positions. These various bias directions, provided by application of a single force to a single point on the bail arm (thus affording advantageous structural simplicity), enable the bail to be moved through a plurality of motion paths as described and in particular to approach the operating position from the clearance position along an upward and rearward path in which the bail rollers continuously engage the platen so as not only to prevent buckling of the work sheet but also positively to smooth the work sheet against the platen. This desired direction of approach to the operating position is achieved without the snapping or jerking action commonly encountered in moving a conventional multiposition paper bail to operating position from the forward clearance position III of FIG. 2 and occasioned by the provision of a positive detent at the forward clearance position in conventional bails.

It is to be understood that the invention is not limited to the features and embodiments hereinabove specifically set forth but may be carried out in other ways without departure from its spirit.

I claim:

1. In a typewriter, in combination with a platen and frame structure carrying said platen, a paper bail structure comprising a torque shaft journalled for rotation about its axis in said frame structure in axially parallel relation to said platen; a pair of torque arms respectively fixedly secured to said torque shaft adjacent opposite ends of said platen for rotation with said torque shaft providing forward and rearward pivotal movement of said torque arms relative to said platen, at least one of said torque arms having a slot extending in the direction of pivotal movement of said torque arms, said slot having a forward end and a rearwar end; a fixed stop member projecting from said frame structure through said slot in said one torque arm for engaging said forward end of said slot to arrest rearward pivotal movement of said torque arms and engaging said rearward end of said slot

to arrest forward pivotal movement of said torque arms; a pair of bail arms respectively pivotally secured to said torque arms for downward and upward pivotal movement relative to said torque arms, that one of said bail arms which is mounted to said one torque arm having a projecting portion disposed to engage said stop member upon upward pivotal movement of said bail arms to a preselected upward position thereby to arrest upward displacement of said bail arms at said preselected position; a bail member secured to and extending between said bail arms in axially parallel relation to said platen and disposed to be carried into and away from engagement with said platen by downward and upward pivotal movement of said bail arms at all positions of said torque arms; and spring means acting between said frame structure and said bail arms for biasing said bail arms downwardly when said bail arms are in a downward position and upwardly when said bail arms are in said preselected upward position while biasing said torque arms rearwardly at all positions of said torque arms and said bail arms.

2. In a typewriter, in combination with a platen and frame structure carrying said platen, a paper bail structure comprising a torque shaft journalled for rotation about its axis in said frame structure rearwardly of said platen and in axially parallel relation to said platen; a pair of torque arms respectively fixedly secured to said torque shaft adjacent opposite ends of said platen for rotation with said torque shaft providing forward and rearward pivotal movement of said torque arms relative to said platen, said torque arms extending upwardly from said torque shaft, at least one of said torque arms having a slot spaced above said torque shaft, said slot extending in the direction of pivotal movement of said torque arms and having a forward end and a rearward end; a fixed stop member projecting from said frame structure through said slot in said one torque arm for engaging said forward end of said slot to arrest rearward pivotal movement of said torque arms and engaging said rearward end of said slot to arrest forward pivotal movement of said torque arms; a pair of bail arms respectively mounted by pivots to the upper ends of said torque arms for downward and upward pivotal movement relative to said torque arms, said bail arms extending forwardly from said pivots, and that one of said bail arms which is mounted to said one torque arm having a portion projecting rearwardly from the pivot mounting said one bail arm, said projecting portion being disposed to rotate downwardly to engage said stop member upon upward pivotal movement of said bail arms to a preselected upward position thereby to arrest upward displacement of said bail arms at said preselected position; a bail member secured to and extending between the forward ends of said bail arms in axially parallel relation to said platen and disposed to be carried into and away from engagement with said platen by downward and upward pivotal movement of said bail arms at all positions of said torque arms; and a spring acting between said frame structure and a point on one of said bail arms eccentric to the pivot mounting said one bail arm to exert continuously on said point a force having a net rearward component, for biasing said bail arms downwardly when said point is in a first range of positions corresponding to downward position of said bail arms and upwardly when said point is rotated into a second range of positions by upward pivotal movement of said bail arms while biasing said torque arms rearwardly at all positions of said torque arms and said bail arms.

3. In a typewriter, in combination with a platen and frame structure carrying said platen, a paper bail structure comprising a torque shaft journalled for rotation about its axis in said frame structure rearwardly of said platen and in axially parallel relation to said platen; a pair of torque arms respectively fixedly secured to said torque shaft adjacent opposite ends of said platen for rotation with said torque shaft providing forward and rearward pivotal movement of said torque arms relative to said platen, said torque arms extending upwardly from said torque shaft and having arcuate slots spaced above said torque shaft, said slots extending in the direction of pivotal movement of said torque arms and each having a forward end and a rearwar end; a fixed rod secured to said frame structure and extending through said slots of said torque arms in axially parallel relation to said platen for engaging said forward ends of said slots to arrest rearward pivotal movement of said torque arms and engaging said rearward ends of said slots to arrest forward pivotal movement of said torque arms; a pair of bail arms respectively mounted by pivots to the upper ends of said torque arms for downward and upward pivotal movement relative to said torque arms, said bail arms extending forwardly from said pivots and having portions projecting rearwardly from said pivots, said rearwardly projecting portions being disposed to rotate downwardly to engage said rod upon upward pivotal movement of said bail arms to a preselected upward position thereby to arrest upward displacement of said bail arms at said preselected position; a bail member secured to and extending between the forward ends of said bail arms in axial parallel relation to said platen and disposed to be carried into and away from engagement with said platen by downward and upward pivotal movement of said bail arms at all positions of said torque arms; a first pin carried by one of said bail arms at a locality eccentric to the pivot mounting said one bail arm; a second pin carried by said frame structure in facing relation to and below said first pin; and a torsion spring having upper and lower arms respectively bearing against said first and second pins, said torsion spring being continuously under compression between said pins and being disposed to exert continuously on said first pin a force having a net rearward component, for biasing said bail arms downwardly when said first pin is in a first range of positions corresponding to downward position of said bail arms and upwardly when said first pin is rotated into a second range of positions by upward pivotal movement of said bail arms while biasing said torque arms rearwardly at all positions of said torque arms and said bail arms.

4. In a typewriter, in combination with a platen and frame structure carrying said platen, paper bail structure comprising a pair of torque arms respectively pivotally secured to said frame structure at pivot points adjacent opposite ends of said platen for forward and rearward pivotal movement relative to said platen; a fixed stop member projecting from said frame structure toward one of said torque arms, said one torque arm having forward and rearward portions engageable with said stop member for limiting rearward and forward pivotal movement of said torque arms relative to said platen to a predetermined range of positions; a pair of bail arms respectively pivotally secured to said torque arms for downward and upward pivotal movement relative to said torque arms, that one of said bail arms which is mounted to said one torque arm having a projecting portion disposed to engage said stop member upon upward pivotal movement of said bail arms to a preselected upward position thereby to arrest upward displacement of said bail arms at said preselected position; a bail member secured to and extending between said bail arms in axially parallel relation to said platen and disposed to be carried into and away from engagement with said platen by downward and upward pivotal movement of said bail arms at all positions of said torque arms; and a bias spring anchored to said frame structure and to a point on one of said bail arms, providing a bias force that is directed rearwardly with respect to the line interconnecting said point on said last-mentioned bail arm and the pivot point of the torque arm connected to said last-mentioned bail arm throughout said predetermined range of torque arm positions, for biasing said bail arms downwardly when said bail arms are in a downward position and upwardly when said bail arms are in an upward position while biasing said torque arms rear-

wardly at all positions of said torque arms and said bail arms.

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