July 3, 1962 M. STERN 3,042,179

SHEET FEEDING MECHANISM

Filed Oct. 19, 1959 2 Sheets-Sheet 1

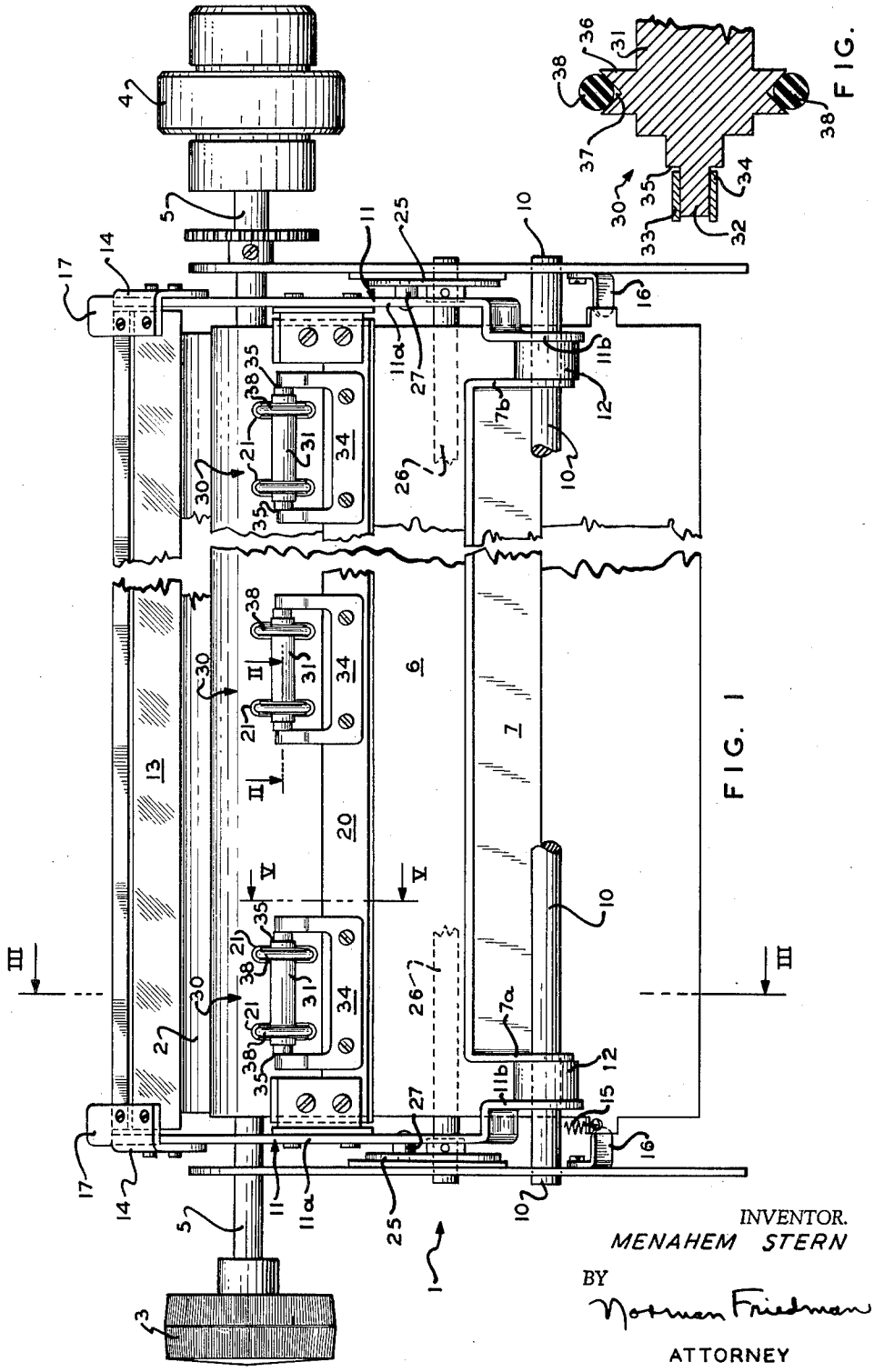


FIG. 1

FIG. 2

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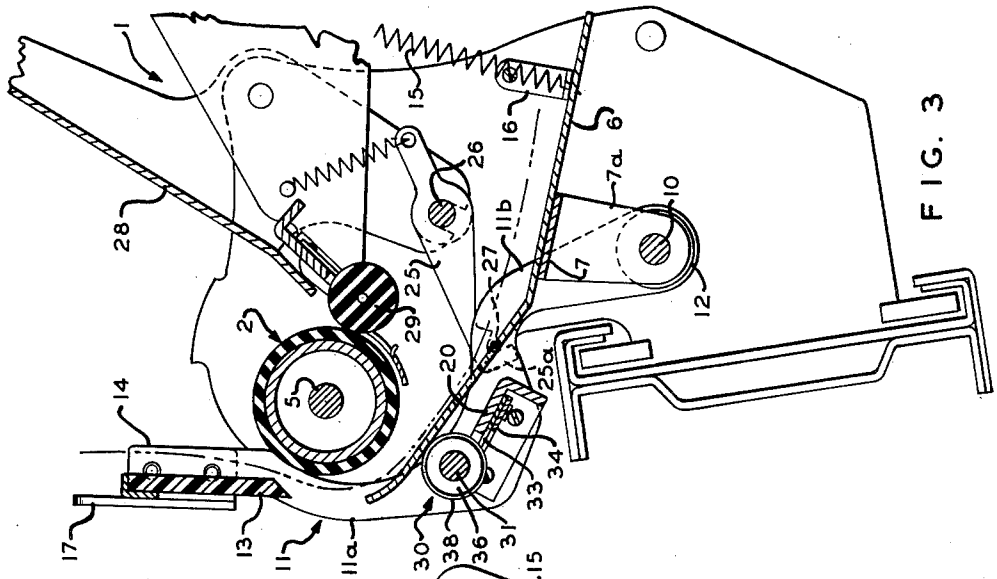


FIG. 3

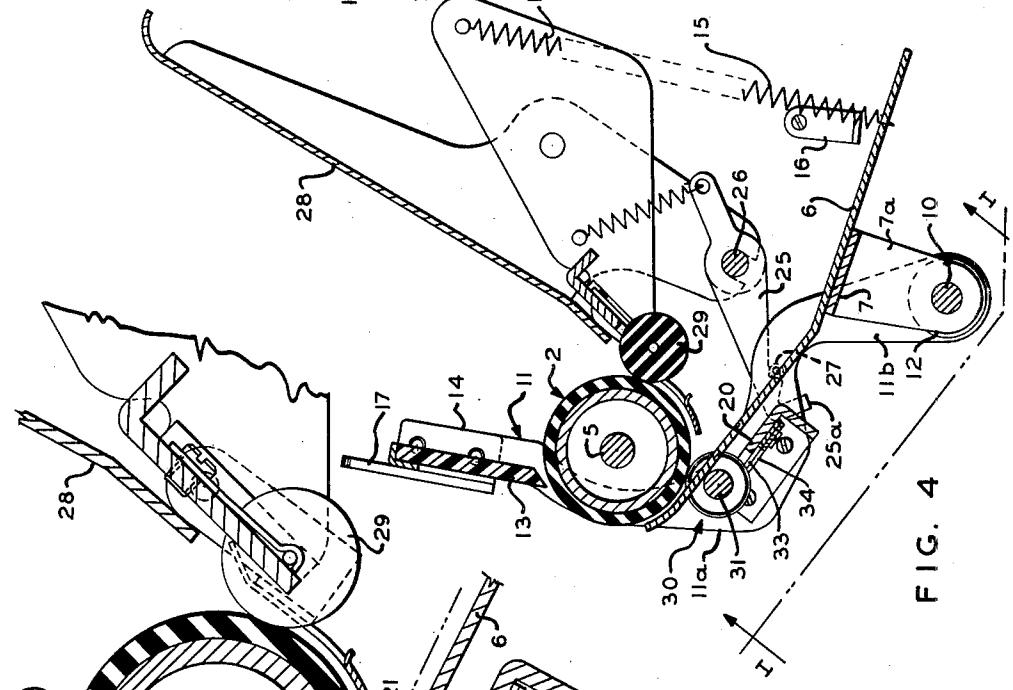


FIG. 4

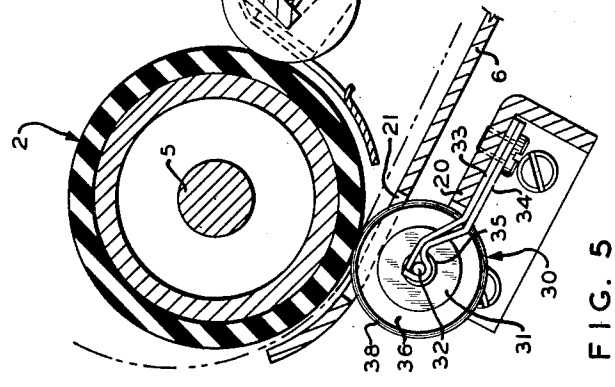


FIG. 5

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SHEET FEEDING MECHANISM

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8 Claims. (Cl. 197—138)

This invention relates to sheet feeding mechanism for business machines. More particularly, it is concerned with an improved pressure roller for such mechanism.

In typewriters, printing calculating machines, and the like, it is customary to effect feeding movement of record sheets by means of a platen (or equivalent member) against which the sheet is firmly held by means of pressure rollers urged toward the platen. Heretofore, such pressure rollers have been of substantial length, and have been fabricated by molding a cylindrical body of resilient material, e.g., rubber, around an elongated core pin of relatively small diameter.

The rollers do not wear evenly and after a period of use it will be found that the record sheet is not gripped with the same degree of force at different points along the longitudinal contact line between the roller and the sheet. When paper feed is effected by such a roller, therefore, there is a tendency to crumple the paper and/or to cause skewed feeding.

Also, replacement of worn rollers has in the past required removal of the entire roller and substitution of a corresponding new unit.

In accordance with the present invention, the above disadvantages are avoided by making the roller in the form of a substantially rigid core on the outer periphery of which is securely mounted a narrow resilient ring which may be seated in a peripheral recess of the core. In the preferred form of the invention disclosed herein, at least two such rings are provided on a single elongated core, said rings being longitudinally spaced and mounted on flanges of the core.

Because of the relatively small contact area between each ring and the sheet, the spaced rings will exert a substantially equal gripping force regardless of uneven wear of the rings. Further, when a ring has worn to the point where replacement is required, only the ring itself need be changed.

A further advantage of the invention has to do with facilitating insertion of the record sheet around the platen. Many machines of the type to which the invention is applicable include a guide plate adjacent the platen which defines a front-feed chute to properly direct the sheet around the platen. This plate is usually interposed between the platen and the rotation axis of the pressure rollers, and has a slot through which each roller protrudes to grip the record sheet against the platen. Since the resilient paper-contacting surface of conventional rollers is elongated, the slots through which they extend have of necessity been as long as the roller. This, coupled with the fact that a large number of rollers (and corresponding slots) is usually provided, has rendered the insertion of paper troublesome since the leading edge of the sheet tends to catch on the edges of the slots.

Such machines also generally include provision for rear feed of the paper as well as front feed. The problem of the sheet catching in the aforesaid roller slots is even more acute when rear feed is effected, since by the time the leading edge of the sheet has reached the front-feed roller slots, a substantial portion of the sheet has already passed between the platen and rear-feed pressure rollers and around a substantial portion of the platen, whereby the sheet can no longer be readily controlled by the operator.

In the past, deflector lips and the like have been used to prevent the sheet from being caught in the roller slots. These expedients, in addition to adding to the cost of the machine, have not proved wholly satisfactory in overcoming the problem.

However, the roller of the present invention provides a simple and economical solution in that it has a paper gripping portion which is extremely narrow thereby permitting the use of a correspondingly narrow slot in the chute plate whereby it is almost impossible for a sheet to be caught in the slot. Furthermore, when a single roller of the invention is provided with a plurality of axially spaced sheet-contacting rings in accordance with the invention, a separate narrow slot may be provided for each of said rings as distinguished from prior arrangements wherein the slot had to be as long as the entire roller.

It is therefore the object of the invention to provide a new and improved sheet-feeding mechanism.

It is a further object to provide a sheet-feeding mechanism incorporating a new and improved roller.

A further object is the provision of a sheet-feeding mechanism having a roller structure which will continue to exert substantially constant gripping force on the sheet at different longitudinal points despite uneven wear at these points.

It is a further object to provide a sheet-feeding mechanism having a roller structure which may be economically fabricated.

A further object is the provision of a sheet-feeding mechanism having a roller structure wherein it is necessary to replace only an inexpensive component thereof after excessive wear occurs.

The above and other objects, features, and advantages of the present invention will be more fully understood from the following specific description when considered in connection with the accompanying drawings, in which:

FIG. 1 is a bottom view taken on line I—I of FIG. 4, showing the carriage of an adding-listing machine in which the invention is incorporated.

FIG. 2 is a fragmentary longitudinal section of the roller of the invention, taken on line II—II of FIG. 1.

FIG. 3 is a sectional view in elevation of the carriage taken on line III—III of FIG. 1 showing the front-feed chute in open position.

FIG. 4 is a view similar to FIG. 3 showing the front-feed chute in closed position.

FIG. 5 is an enlarged fragmentary view showing a portion of FIG. 4, taken on line V—V of FIG. 1.

For the purposes of the present disclosure the sheet feeding mechanism of the invention is shown incorporated in the carriage of a conventional listing-adding machine of the type disclosed in U.S. Patent No. 2,081,423 granted May 25, 1937, to L.P. Crosman. It will be understood, however, that this particular disclosed environment of the invention is illustrative only since the subject of the invention finds utility in many other types of machines, for example, typewriters, listing machines in which there is no movable carriage, tabulating machines, etc.

Referring now to the drawings, the reference numeral **1** designates the carriage of the machine. A conventional platen **2** is journalled for rotation in the carriage framing and is adapted to be rotated manually by turning either of knobs **3** and **4** (FIG. 1) respectively located at the opposite ends of the platen shaft **5**. A sheet of paper upon which printing is to be effected by suitable printing mechanism (not shown) can be front fed to the platen. For this purpose there is provided a plate **6** which is of substantially the same width as the platen, and which in conjunction therewith defines a front-feed chute. The plate **6** is rigidly secured to a bail **7** which extends across substantially the length of the carriage and terminates at its

opposite ends in depending arms 7*a*, 7*b* which are journalled for rotation on a fixed shaft 10.

Provided on the opposite respective sides of the carriage are two similar arms 11 each of which comprises substantially vertical upper and lower portions 11*a*, 11*b* interconnected by a horizontal offset portion. The lower arm portions 11*b* are journalled on said shaft 10 and spaced from the adjacent depending arms 7*a*, 7*b* respectively of bail 7 by means of collars 12. An elongated transparent paper guide 13 extends between the upper ends of the two arms 11 and is rigidly secured to said arms by means of angle brackets 14.

When paper is to be inserted, plate 6 is disposed in the counterclockwise open-throat position shown in FIG. 3. A spring 15 normally urges the plate to tthis position abutting stop members 16 carried by the carriage framing. In the open-throat position, paper guide 13 stands substantially vertically and provides sufficient clearance between its lower end and the adjacent platen 2 to allow the operator to readily insert the work sheet between these two members. The position of the paper when inserted into the carriage is shown in broken lines in FIG. 3.

To close the throat, the operator merely grasps an upstanding portion 17 of either the left-hand or right-hand bracket 14 and pushes toward the rear of the machine, that is, to the right in FIG. 3, thereby rocking arms 11 clockwise about shaft 10. A bail 20 extends across the carriage beneath plate 6 and is rigidly secured at its ends to arms 11. Supported by bail 20 is a plurality of pressure rollers 30 which form the subject of the present invention and which will be described in greater detail subsequently. Each roller includes a plurality of axially spaced flanges 36 on the outer rims of which are mounted annular resilient rings 38 adapted to engage the paper. For this purpose, the flanges 36 are adapted to extend through corresponding narrow slots 21 in plate 6. However, in open-throat position (FIG. 3) the limiting counterclockwise position of plate 6 is such that no portion of the flanges 36 and associated rings 38 protrudes through slots 21 whereby there will be no interference with paper insertion. As arms 11 are rocked to the rear, the rollers 30 are carried therewith. In the initial portion of this movement, plate 6 will remain stationary while a portion of each flange 36 moves through the corresponding slot 21. As arms 11 continue to move rearwardly, a cylindrical core portion 31 of each pressure roller engages the underside of plate 6 and swings the plate in like direction against the urge of spring 15. The rearward movement of arms 11 and plate 6 is terminated when the annular portions of the pressure rollers engage the work sheet and firmly press it against the platen. The final, closed-throat position of the parts is shown in FIGS. 4 and 5. Arms 11 are releasably held in open- and closed-throat position by means of detent levers 25 which are spring-biased counterclockwise about shaft 26 as an axis. Each lever is provided with a forward downturned end portion 25*a* just behind which are two adjacent recesses either of which receives a lateral stud 27 of the related arm 11 to detent the arm in its respective forward and rear positions (FIGS. 3, 4). The downturned end 25*a* cooperable with stud 27 serves as a limit stop for forward movement of said arms 11.

The work sheet can also be rear fed around the platen. for this purpose, the carriage includes a conventional inclined plate 28 to the rear of the platen 2 which will direct the sheet between the platen and conventional pressure rollers 29. The paper is inserted with the front-feed mechanism in the open position of FIG. 3. The platen is rotated to advance the sheet partially. Plate 6 is then manually rocked clockwise to closed position and is so held by the operator while the platen is again operated to feed the sheet. At this time arms 11 are still in forward position to provide maximum spacing of the guide 13 from the platen, between which two elements plate 6 will direct the sheet. When the leading edge of the sheet has moved above the lower edge of the guide, arms 11 are then swung to the rear to bring the guide to closed position, and plate 6 will now be held in closed position by the roller core 31. The outer portions 38 of the rollers 30 also serve to hold the sheet firmly against the platen so that when the latter is rotated, both sets of pressure rollers 29 and 30 cooperate therewith to effect feeding of the sheet.

The improved pressure roller of the invention will now be described. As best seen in FIGS. 1 and 2, each pressure roller 30 includes a cylindrical elongated core 31 of rigid mateiral such as steel. The opposite ends of core 30 are stepped down in diameter and terminate in integral axially extending pins 32. The roller is supported for rotation by conventional means comprising two superimposed U-shaped members 33 and 34 formed of thin sheet material such as resilient spring steel rigidly secured along their bight portions to bail 20.

The arms of lower U-member 34 are bent at their forward, free ends to form aligned semicircular channels for rotatably receiving each of the aforesaid core pins 32, in which channels said pins are held by the overlying forward ends of the arms of U-member 33 (FIG. 5). The shoulder 35 which defines the inner end of each of pins 32 serves as a limiting means to prevent excessive longitudinal movement of the core in the channels.

Adjacent each of its ends the core 31 includes an integral flange 36 formed in its outer edge surface with an annular groove 37 which extends completely about the periphery of the flange. Firmly seated in said groove 37 is a ring-like member 38 of resilient elastomeric material such as soft rubber or the like. As best seen in FIG. 2, in the present preferred embodiment ring 38 is circular in cross section and groove 37 V-shaped in cross section so as to facilitate accurate positioning of the ring and to constrain said ring against lateral displacement. It will be understood, however, that both the ring and/or the groove may be of other cross-sectional shapes, e.g., square, oval, etc. The ring 38 may conveniently be a conventional O-ring.

The normal, unstretched inner diameter of ring 38 is smaller than the corresponding dimension it assumes when assembled on flange 36. Accordingly, the ring securely grips the inclined side walls of groove 37 and will not be inadvertently stripped from the flange in normal use. Additionally, the ring may be adhesively secured in the groove. Assembly of the ring on the flange or removal therefrom is easily effected by stretching the ring sufficiently to allow it to clear the outer edge of the flange.

As described earlier, each flange 36 and associated ring 38 are adapted to extend through a narrow slot 21 in plate 6 but do not do so when the plate is in open-throat position (FIG. 3). When the front feed mechanism is moved to closed position in the aforedescribed fashion the roller mounting members 33, 34 will yieldably but firmly hold the rollers against the sheet whereby the rings 38 in cooperation with the platen 2 grip the sheet at spaced points and are adapted to effect feeding thereof upon rotation of the platen.

Various modifications within the scope of the invention are possible. Thus, although only two paper-gripping rings are provided on each roller in the present form of the invention, a greater number can be used. Also, instead of mounting a plurality of rings on a single core having a plurality of flanges, each ring can be mounted on an individual disc-like member recessed along its outer edge. The assembled ring, rather than being made originally as a continuous closed loop, could be a linear strip suitably secured as by adhesive in the flange groove.

It will therefore be understood that the specific embodiment herein shown and described in detail is intended to be illustrative only and not limitative of the appended claims, and that the above and other modifications and variations of the invention as fall within the scope of said claims are intended to be covered thereby.

I claim:

1. In a sheet feeding mechanism for a business machine, two cooperating feed members operable to grip a sheet therebetween and effect feeding movement thereof: one of said feed members comprising an elongated platen of substantially uniform diameter, the other of said feed members comprising a short roller having a peripheral, outwardly opening groove; and a ring of elastomeric material seated in said groove, said ring constituting the effective sheet gripping and feeding structure of said roller; said groove being substantially V-shaped in cross section, the portions of the ring which engage the side walls of the groove being convexly curved relative to said side walls.

2. The invention according to claim 1, said ring being circular in cross-section.

3. The invention according to claim 2, said roller including an annular flange, said groove being formed in the outer edge of said flange.

4. In a sheet feeding mechanism for a business machine, two cooperating feed means operable to grip a sheet therebetween and effect feeding movement thereof, one of said feed means comprising an elongated platen of substantially uniform diameter, the other of said feed means comprising a plurality of rollers mounted for independent rotation about a common axis, each of said rollers including: a core member, and a plurality of axially spaced

narrow rings of elastomeric material mounted on said core member, said rings constituting the effective sheet gripping and feeding structure of said roller; and means urging each roller toward said platen to cooperate with said platen to grip a sheet therebetween.

5. The invention according to claim 4, further including a plate interposed between said platen and the rotation axis of said rollers, said plate being provided with narrow slots through each of which a corresponding separate one of said rings extends to contact the sheet.

6. The invention according to claim 4, the radially outermost sheet-contacting portions of said rings being convexly curved in cross-section.

7. The invention according to claim 6, said rings being circular in cross-section.

8. The invention according to claim 4, wherein the number of rings mounted on said core member is not more than two.

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