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**Ziegler et al.**

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## [54] FAN-FOLD PAPER GUIDES AND STACKING MECHANISMS


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[52] **U.S. Cl.** .....**270/61 F**, 226/200, 270/39, 270/79, 271/88

[51] **Int. Cl.** .....**B65h 45/00**

[58] **Field of Search** .....226/196, 200; 271/86, 88; 270/61 F, 79, 39, 40



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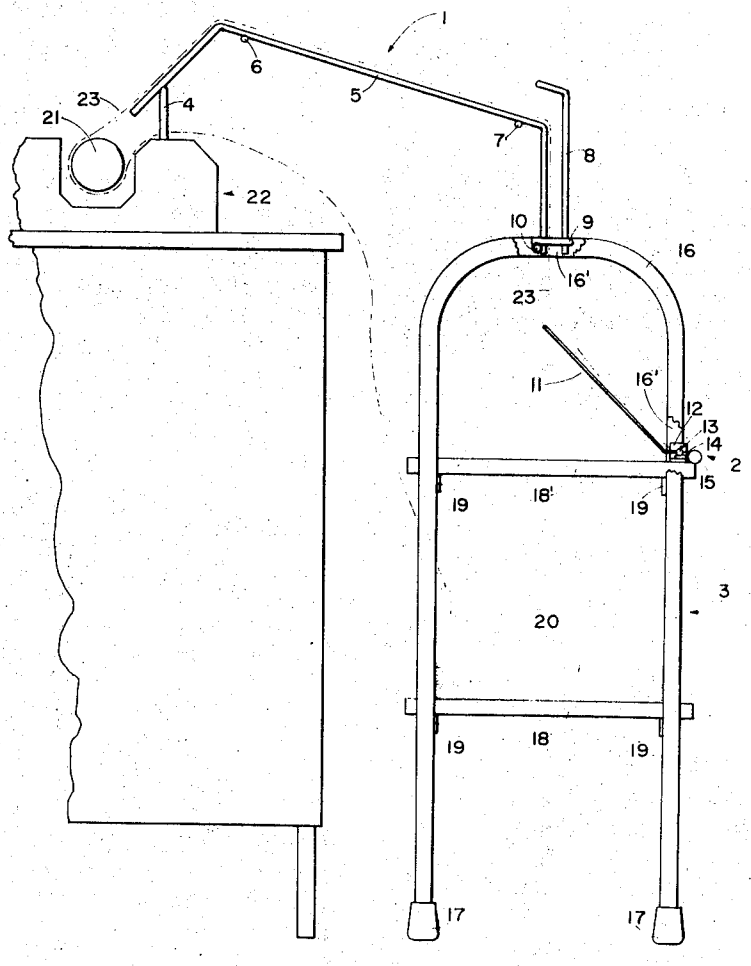
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[57] **ABSTRACT**

This invention relates to paper guides and paper stacking mechanisms, and more particularly to guides and stacking mechanisms for continuous paper forms of single or multiple ply of the variety known as fan-fold or accordion fold, during its passage from a printing device, over a guide, and through a stacking mechanism to a collecting table.


**1 Claim, 4 Drawing Figures**



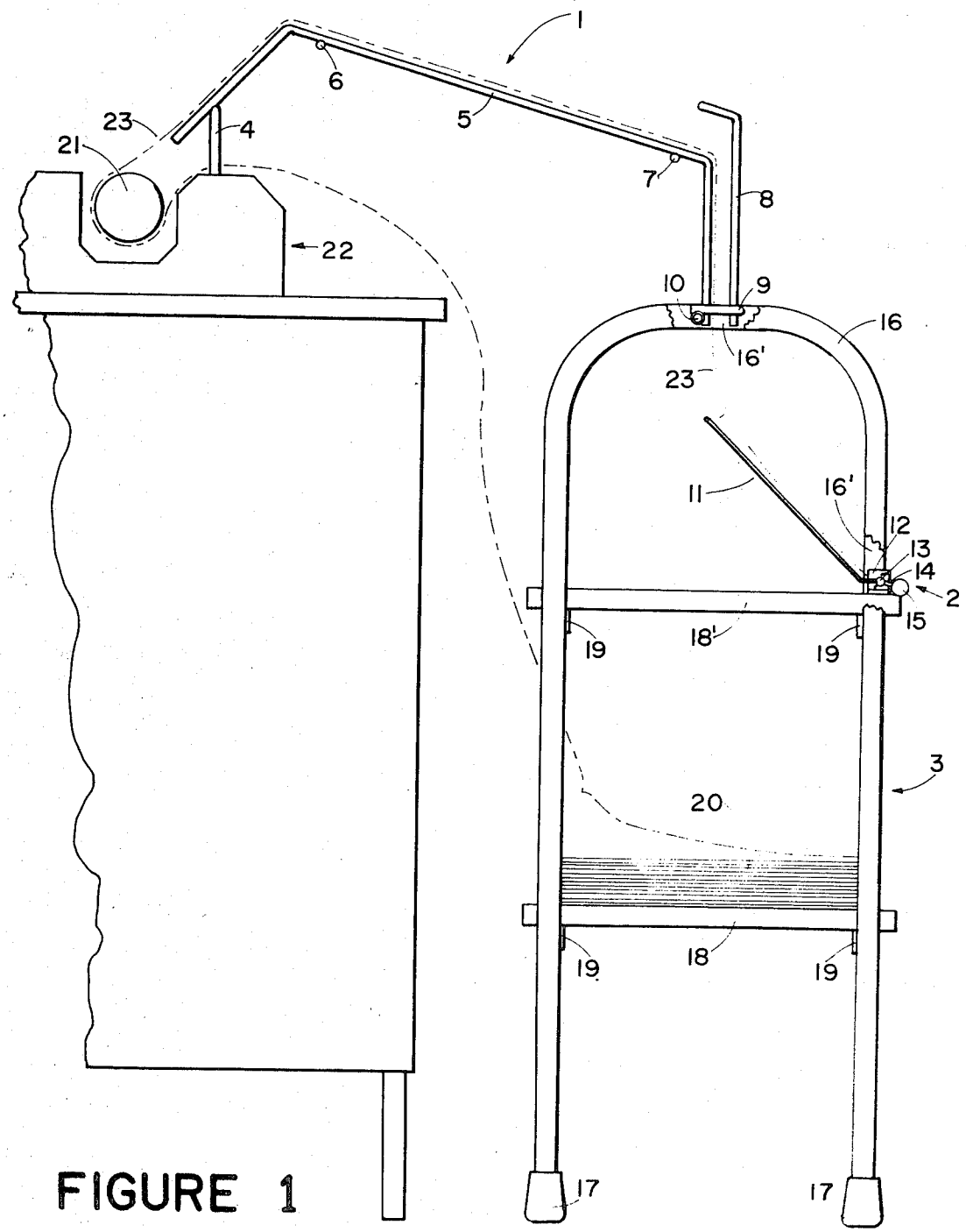



FIGURE 1

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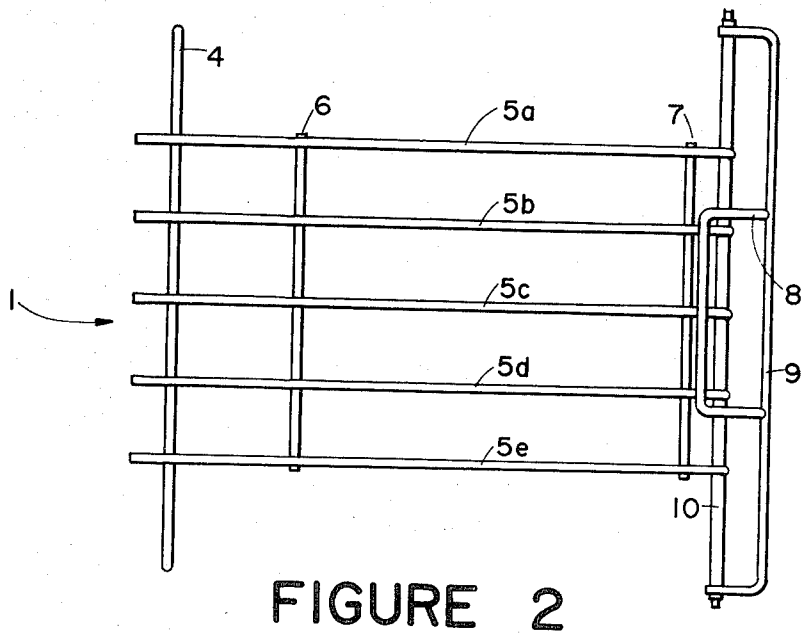



FIGURE 2

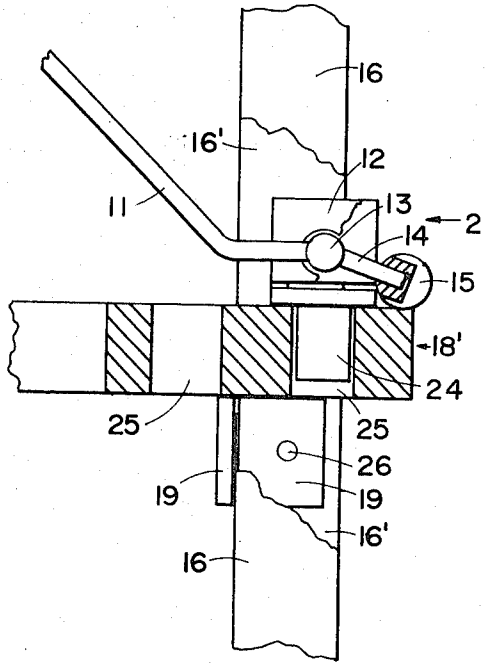
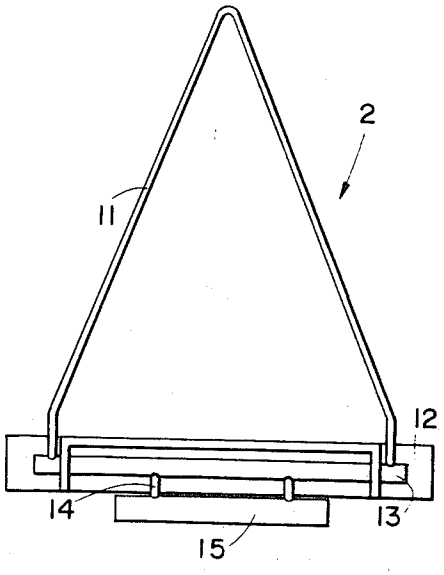



FIGURE 3

FIGURE 4




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# FAN-FOLD PAPER GUIDES AND STACKING MECHANISMS

At the present time there is no equipment designed for use with computer terminals and similar devices which is capable of automatically guiding and restacking the continuous fan-fold forms commonly used with such devices. As a result, the paper supply is usually placed on the floor behind the machine, where the printed portion returns and falls in a heap. It is not uncommon to find a table also in use for holding the unused paper and collecting its printed portions. There are guides available which attach directly to the printing device. Such guides do no more than remove the printed portions of the paper from the printing device, as is their purpose. The guides, designed for permanent or semi-permanent attachment directly to the device they serve, are not easily removed or transferred, as they must be detached, and such attachment as is necessary usually requires some physical alteration or damage to the device to which it is attached. No provision is made to insure that the printed paper does not overshoot the table, as is especially the case if the paper is stiff. No provision is made to prevent the paper, after striking the receiving shelf of said table, from refolding itself over the edge of the shelf and thus falling off because of its overhanging weight. No provision is made to prevent the paper which may already be restacking properly from swinging over and off the edge of the receiving shelf and pulling the restacked portion after it to the floor. Because such guides and tables are not connected, proper positioning is difficult. The foregoing problems require frequent, if not constant, attention from the user of such devices.

Therefore the first object of this invention is to provide an easily removable and transferable guide which requires only physical contact with the device which it serves.

The second object of this invention is to insure, through means of a stopping and guiding device, that such fan-fold paper as may be used will be guided towards a receiving shelf and prevented from overshooting said shelf.

The third object of this invention is to provide a means, adjustable to most common sizes of fan-fold paper, to direct and so position the imprinted portion of the paper on a receiving shelf so that it will refold itself by the force of gravity if prevented from falling off of said shelf.

The fourth object of this invention is to provide means of preventing paper which is successfully restacking from failing to return at a crease, thereby insuring uninterrupted continuation of the restacking process.

The fifth object of this invention is to provide a self-contained and prealigned unit to accomplish the above objects in an automatic manner, thus requiring no attention from its user during its operation.

Other objects, advantages, and novel features of this invention will become apparent from the drawings and detailed descriptions of a preferred form of the invention which follow.

In the drawings:

FIG. 1 is a side elevation view of the entire device in use with a typical printing device, showing the path of the paper through both devices. Three sections of the invention are cut away in order that important details might not be obscured.



FIG. 2 is a top or plan view of the upper guide and stacking mechanism shown in FIG. 1.

FIG. 3 is an enlargement of a portion of FIG. 1, utilizing sectional and cutaway views to show hidden parts.

FIG. 4 is a top or plan view of the lower guide and stacking mechanism.

The preferred embodiment of the invention includes three basic sections: an upper guide and stacking mechanism **1**, a lower guide and stacking mechanism **2**, and a supporting table **3**.

With respect to FIG. 1 and FIG. 2, the upper guide and stacking mechanism is composed of several parts, each a smooth and rigid rod of the necessary shape: five guide rods **5***a*–**5***e*, one machine rest bar **4**, one first cross support **6**, one second cross support **7**, one overshoot stop **8**, one swing stop **9**, and one first pivot rod **10**. Each of the guide rods **5** may be thought of as being divided into first and second sections by a first bend and into second and third sections by a second bend. Said first bend has an included angle of greater than 90° and less than 180°; said second bend has an included angle of at least 100° and less than **135°**. All sections of each guide rod lie in a single plane, and all five planes are mutually parallel and evenly spaced. The first and second ends of each rod, being the ends of the first and third sections, respectively, lie on the same side of the second section, which side is called the lower side.

A first cross support **6** is securely attached to and perpendicular to the second sections of guide rods **5**, said attachment being on the lower side of said second sections and near the first bend of each rod. A second cross support **7** is securely attached to and perpendicular to the second sections of guide rods **5**, said attachment being on the lower side of said second sections and near the second bend of each rod. Said first and second cross supports **6** and **7** are terminated on the respective far sides of guide rods **5**a and **5**e near their points of attachment. A machine rest bar **4** is securely attached to and perpendicular to the first sections of guide rods **5**, said attachment being on the lower side of said first sections near the first ends. Said machine rest bar **4** has ends bent downward at right angles so as to lie in a plane parallel to the plane of the third sections of the guide rods **5**.

A first pivot rod **10** is securely attached to and perpendicular to the third sections of guide rods **5**, said attachment being on the lower side; i.e., the side nearest the first ends of the guide rods **5**, at the second ends of guide rods **5** but not extending past said second ends. A short portion of each end is of smaller diameter than the major portion of the first pivot rod **10**. The first cross support **6**, the second cross support **7**, the machine rest bar **4**, and the first pivot rod **10** are attached to the guide rods **5** in such a manner that the center guide rod **5**c is joined to each of said parts at a point equidistant from the ends of each; i.e., at their midpoints.

A swing stop rod **9** having an equal short section at each end bent in the same plane, and to the same side of the middle section, at right angles to the middle section, is attached at its ends to the top side of first pivot rod **10** and at right angles to the plane containing the third sections of guide rods **5**, on the side furthest from machine rest bar **4**. Said attachment points are at an equal distance from each end of first pivot rod **10**, and

the center portion of swing stop rod 9 is parallel to first pivot rod 10.

An overshoot stop 8 has the general shape of an inverted U; i.e., it has sections of equal length at each end bent at right angles downward and in the same plane. Said overshoot stop 8 also has a bend in each leg of the U near the center section, said bends having an angle equal to the second bends of each of the guide rods 5, both bends being in the same direction. Said overshoot stop 8 is attached near its ends to the swing stop rod 9 on the side nearest the first pivot rod 10. Said attachment positions the ends of the overshoot stop 8 at equal distances from the respective nearest ends of swing stop rod 9. Said overshoot stop 8 also has its sections which lie between its ends and the bends nearest to them parallel to the third sections of guide rods 5. The center section of the overshoot stop 8 extends in the general direction of the machine rest bar 4.

With respect to FIG. 1, FIG. 3, and FIG. 4, the lower guide and stacking mechanism 2 is composed of several parts: one pivoting guide lever 11, one paper stop 12, one second pivot rod 13, two counterweight support rods 14, one counterweight 15, and two mounting pins 24. All of these parts, save the paper stop 12, are formed of smooth rods. The lower guide and stacking mechanism 2, excluding the paper stop 12 and the mounting pins 24, forms a pivoting guide lever and counterweight assembly.

The paper stop 12 is essentially a rectangular box having its top and back side removed, and its base extended a short distance past each end, thus leaving two vertical and indented ends and a vertical front attached to the base. Each end has a hole to accommodate the second pivot rod 13. At equal distances from its ends and under the base are attached two mounting pins 24. Said attachment is centered between the front and back edges of the base and said mounting pins are attached at right angles to the plane of the base. The mounting pins 24 are each a short piece of round rod. Extending through each end of the paper stop 12 in the holes provided is a second pivot rod 13. At right angles to the axis of rotation of second pivot rod 13 and at an equal distance on each side of its midpoint, but still between the ends of the paper stop, are attached two counterweight support rods 14. A counterweight 15, being a short, heavy cylindrical rod, is attached by means of insertion of said counterweight support rods 14 into holes of the proper size provided in the counterweight 15. The counterweight 15 is held to the counterweight support rods 14 by friction, thus making it easily detachable. The length of the counterweight support rods 14 and the size of the counterweight 15 are determined by the weight and geometry of the pivoting guide lever 11 as well as by the actual application of the device; i.e., the size and weight of the paper to be used with it. At or near the ends of the second pivot rod 13 are securely attached the ends of the pivoting guide lever 11. Said pivoting guide lever 11 is a lightweight V shaped rod, having a short section at each end bent so as to be mutually parallel and projecting from the plane of the V at an angle of 45°. The length of the parallel end sections is such that the V portion of the pivoting guide lever 11 may lie in the same plane as the base of the paper stop 12 when the ends of the pivoting guide lever 11 are attached to the second pivot rod 13 in the manner previously described. The angle formed between the parallel end sections of the pivoting guide lever 11 and the counterweight support rods 14 is such that when the parallel end sections of the pivoting guide lever 11 are parallel to the plane of the base of the paper stop 12 the counterweight 15 is tangent to said plane.

With respect to FIG. 1 and FIG. 3, the supporting table 3 is composed of several parts: one first pair of table legs 16, one second pair of table legs 16', four feet 17, one bottom shelf 18, one top shelf 18', and four shelf supports 19. Each pair of table legs 16 and 16' is a single piece of tubing in the shape of an inverted U; i.e., having sections of equal length at each end bent in smooth and equal arcs downward to a position perpendicular to the middle section and each pair lying all in one plane.

Attached to each leg is a plastic or rubber foot 17. At a distance approximately one-third of the height of the U from the feet, and also at approximately twice that distance, shelf supports 19 are securely attached at right angles to the plane of each pair of table legs 16 and 16', by means of rivets, screws, or other appropriate means. Centered on these shelf supports 19 are mounted and attached, securely and by appropriate means, a bottom shelf 18 and a top shelf 18'. Said bottom shelf 18 is attached to the two shelf supports 19 nearest the feet 17, and said top shelf 18' is attached to the two shelf supports 19 furthest from the feet 17. Said attachment occurs on the surface of the shelf supports 19 which is furthest from feet 17. The top shelf 18' has several pairs of mounting holes 25 extending through its entire thickness. Each pair of mounting holes 25 lies on a line perpendicular to the ends of the shelf 18'; i.e., those edges parallel to the planes of the legs 16 and 16'. Each pair is spaces equally from the shelf ends and separated by the same distance as are mounting pins 24 of the lower guide and stacking mechanism 2. Said pairs of mounting holes 25 are separated from one another and from one side by approximately equal distances. All of the mounting holes 25 lie on one side of top shelf 18'. On the shelfward side of each pair of table legs 16 and 16', and just off center to the side away from mounting holes 25, is a hole to accommodate the ends of first pivot rod 10.

With respect to FIG. 1 and FIG. 3, the upper guide and stacking mechanism 1 is attached to supporting table 3 by means of the insertion of the ends of first pivot rod 10 in the holes provided in the first and second pairs of table legs 16 and 16'. Said attachment leaves the mounting holes 25 their furthest distance from machine rest bar 4 and the upper guide and stacking mechanism 1 free to pivot about first pivot rod 10. The lower guide and stacking mechanism 2 is removably attached to top shelf 18' by means of the insertion of mounting pins 24 in mounting holes 25. Said attachment positions the point of the V of the pivoting guide lever 11 so that it points towards machine rest bar 4. The second pivot rod 13 of the lower guide and stacking mechanism 2 is free to rotate in the holes of the paper stop 12.

FIG. 1 illustrates a stack of fan-fold paper 20, a simplification of a typical printing device 22, the platen 21 of said printing device, and the path 23 of the paper from stack 20 through the printing device 22 and the

mechanisms of the fan-fold paper guide and stacking mechanism. The ends of machine rest bar **4** rest on the printing device **22** behind platen **21**. The paper passes from the stack **20** under machine rest bar **4**, around the platen **21**, and then up onto the guides rods **5**. As the paper passes over the second bends of the guide rods **5** it is turned downward and prevented from overshooting the top shelf **18'** by overshoot stop **8**. The paper proceeds downward through the swing stop formed by the first pivot rod **10** and the swing stop rod **9**, and then down onto the pivoting guide lever **11**. The leading edge of the paper is guided to the paper stop **12**. Until the leading edge of the paper strikes the paper stop **12** the greater part of the weight of the first section is supported by the following sections of the paper. Upon striking the paper stop **12**, the weight of the first section falls on the pivoting guide lever **11**, as does the weight of the succeeding sections. This causes a force to be exerted on the pivoting guide lever **11** sufficient to overcome counterweight **15** and tip the pivoting guide lever **11** downward as the paper continues to fall. As the paper falls the swing stop, as described above, forces the paper to stack. The paper is prevented from falling over the edge of the top shelf **18'**, and the distance between the swing stop and the top shelf **18'** acts to pull the paper back from either edge as it refolds along a crease or perforation. Interchangeable counterweights **15** of various weights and the several mounting positions available for the lower guide and stacking mechanism **2** together provide for a variety of paper sizes and weights and their proper positioning and automatic restacking on top shelf **18'**.

It is to be understood that the foregoing disclosure relates only to a preferred embodiment of the invention and that it is intended to cover all changes and modifications to the examples of the invention herein chosen for the purposes of the disclosure which do not depart from the spirit and scope of the invention.

What is claimed is:

**1.** A fan-fold paper guide and stacking mechanism comprising:

a table, which in operation is positioned immediately behind the device it serves, having a bottom shelf for holding a supply of fan-fold paper, a top shelf for receiving processed portions of said fan-fold paper, and an attachment means at opposite ends for holding an upper guide mechanism above the top shelf;

an upper guide and stacking mechanism comprising

a machine rest which sits upright on the printing device behind the platen and allows room for the fan-fold paper to pass underneath and into the printing device,

a set of two or more guide rods which extend from the platen, near which they are attached to the machine rest, to a position over that center line of the top shelf which is parallel to the platen, where their end sections are inclined downward to an upright position,

a pivot rod parallel to said centerline and above the top shelf, extending from end to end of the table and attached at its ends to the table, and attached in its middle portion to the downward projecting ends of the guide rods,

a swing stop rod lying parallel to the pivot rod and in a horizontal plane with the pivot rod, having its ends bent towards the pivot rod and attached thereto so as to lie on the far side from the machine rest,

and an overshoot stop, attached at its lower end to the middle portion of the swing stop, being upright and parallel to the upright portions of the guide rods and extending above the guide rods with its top portion inclined towards the machine rest over the gap between the pivot rod and the swing stop,

said arrangement of parts providing that the fan-fold paper, upon leaving the printing device, will be directed towards the top shelf, will be directed downward over said shelf's center line by the overshoot stop, and will be prohibited from swinging free and away from above the center line by the combined pivot rod and swing stop;

a lower guide and stacking mechanism comprising

a supporting base which sits on the top shelf with its axis parallel to the center line, having upright portions to support a pivot rod and an upright paper stop attached to one side parallel to the center line,

a second pivot rod supported by said uprights on the base in a position also parallel to the center line,

a pivoting guide lever attached at one end to the second pivot rod on the same side of the base as the paper stop and extending upwards on an incline to its other end which lies just below and past the gap between the pivot rod and swing stop,

and a counterweight attached to the second pivot rod opposite the pivoting guide lever by means of counterweight support rods at such an angle that it lies on the top shelf while the pivoting guide lever is raised,

said arrangement of parts providing that the pivoting guide lever will catch the fan-fold paper as it passes from the upper guide and direct it to the paper stop, after which the pivoting guide lever will hold the fan-fold paper in proper alignment as it tips to the shelf under the influence of the paper's weight overbalancing the counterweight, thus insuring the proper stacking position for the fan-fold paper when it reaches the top shelf.

* * * * *