

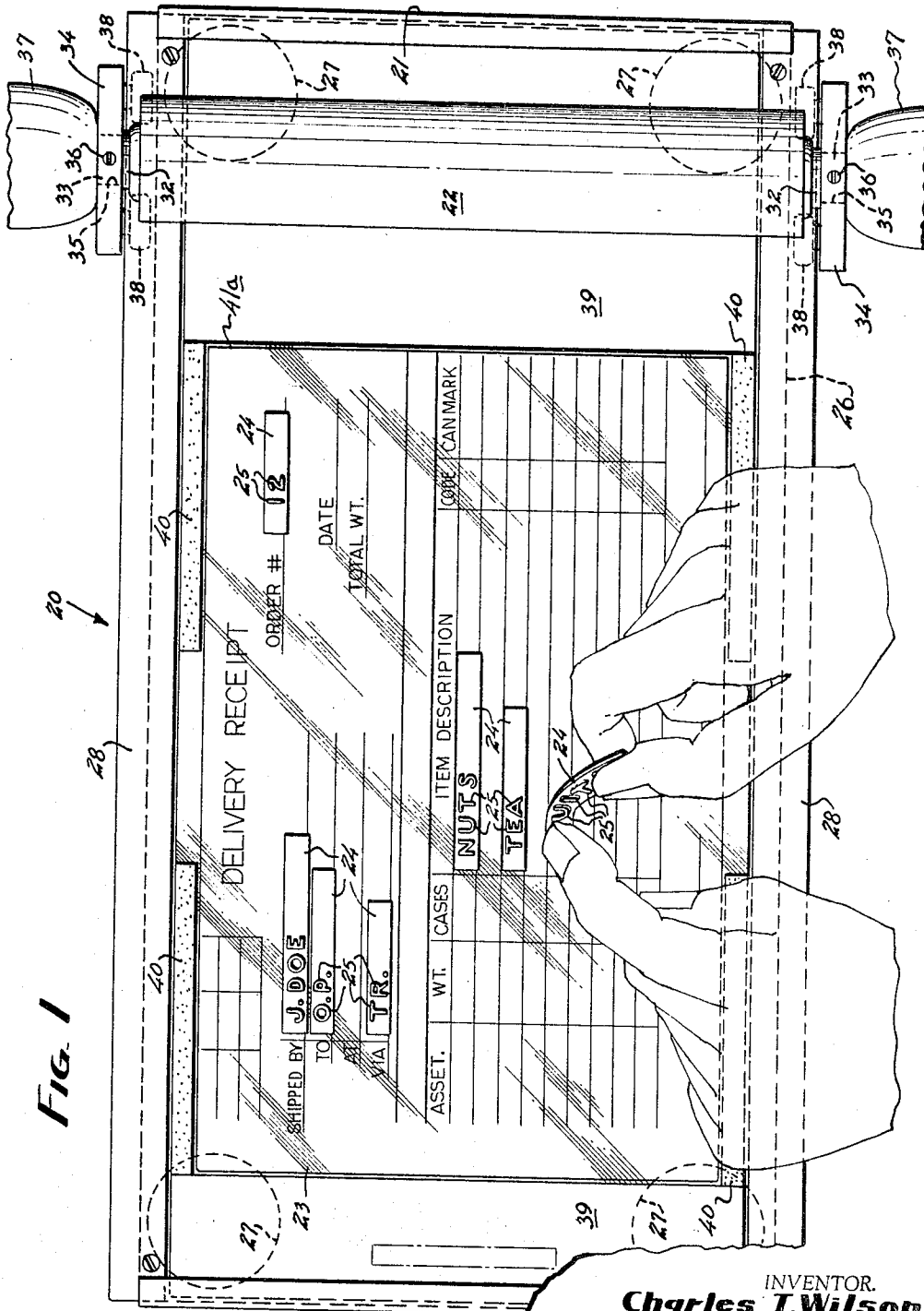
Oct. 18, 1966

Filed May 15, 1964

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METHOD AND APPARATUS FOR SUPPLYING ADDITIONAL
PRINTING TO PREPRINTED FORMS

3,279,368

5 Sheets-Sheet 1



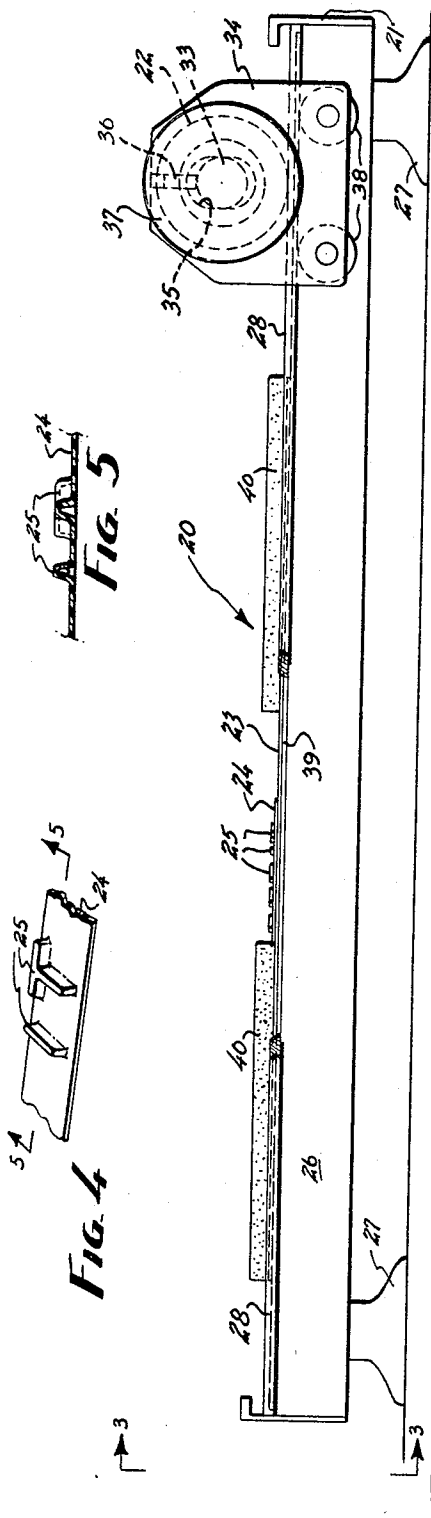
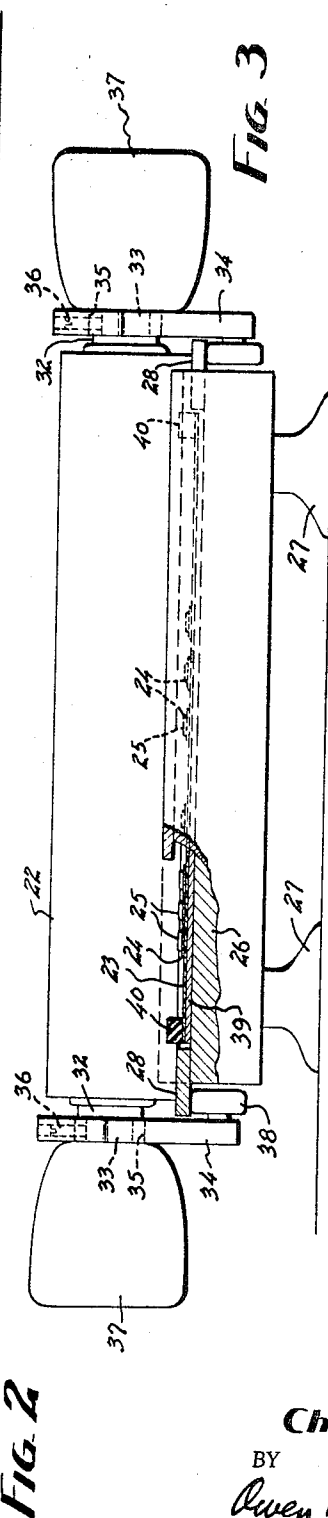
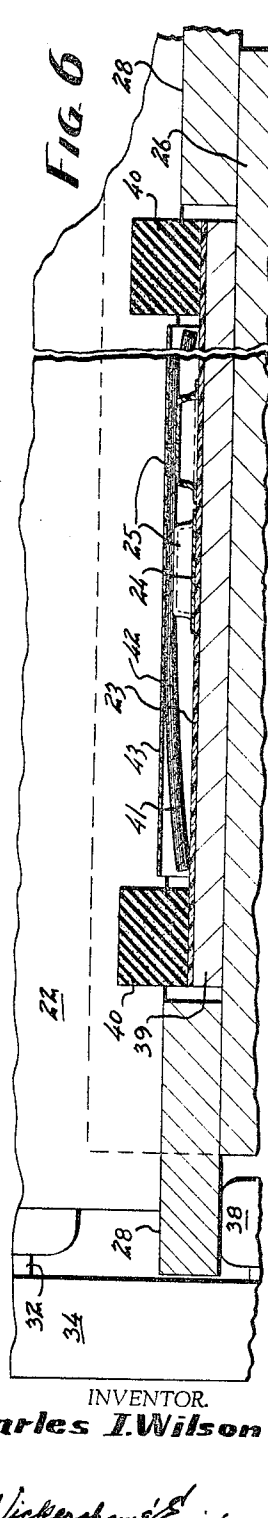
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3,279,368

5 Sheets-Sheet 2



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5 Sheets-Sheet 3

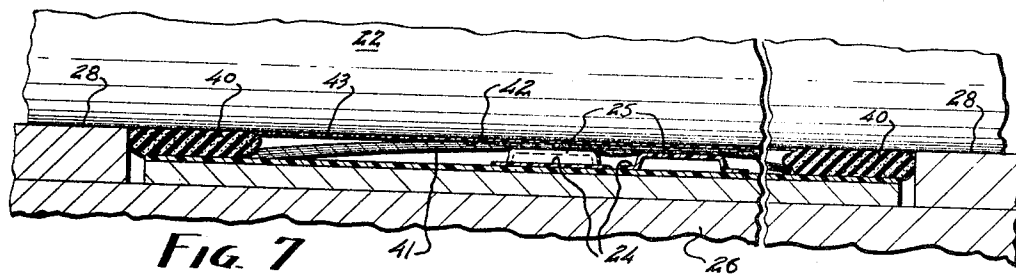


Fig. 7

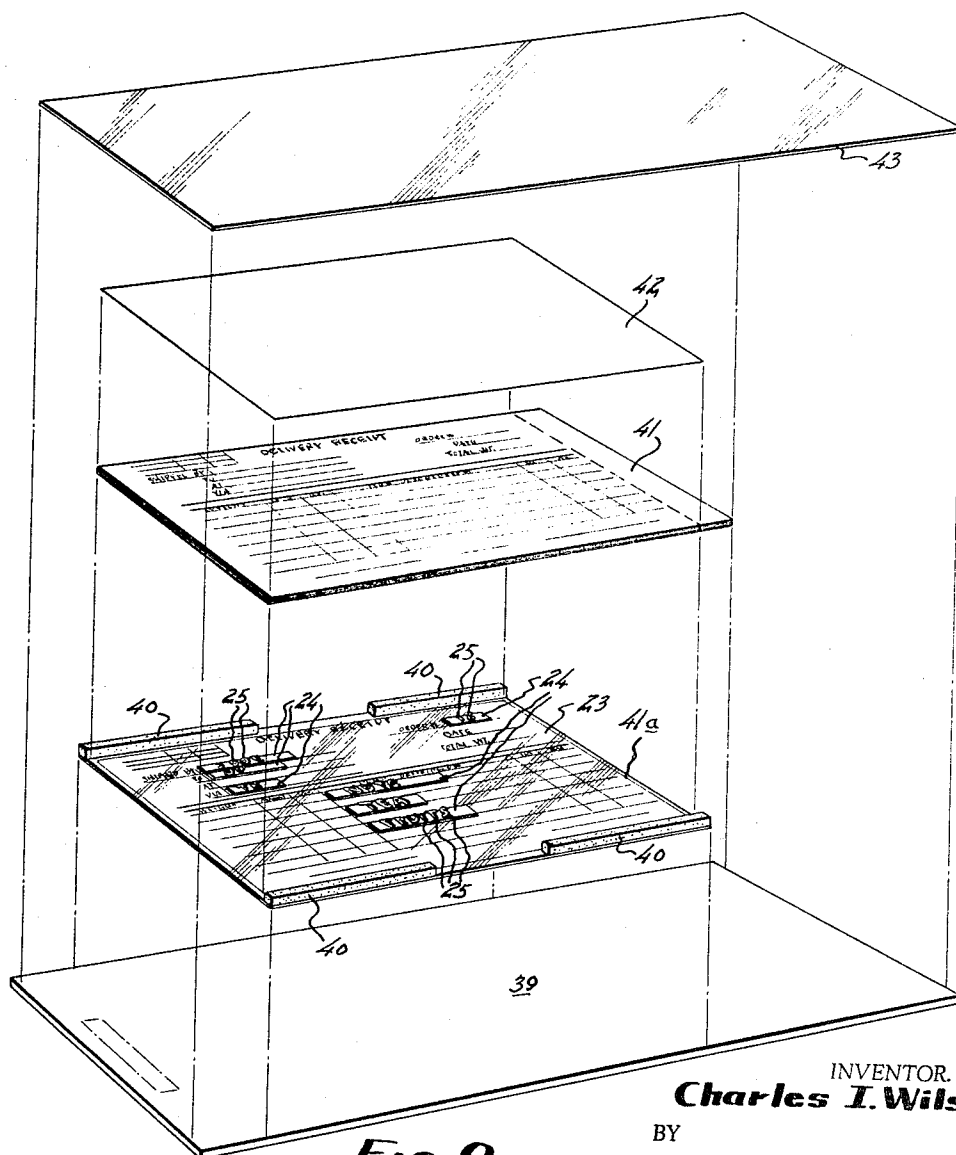


Fig. 8

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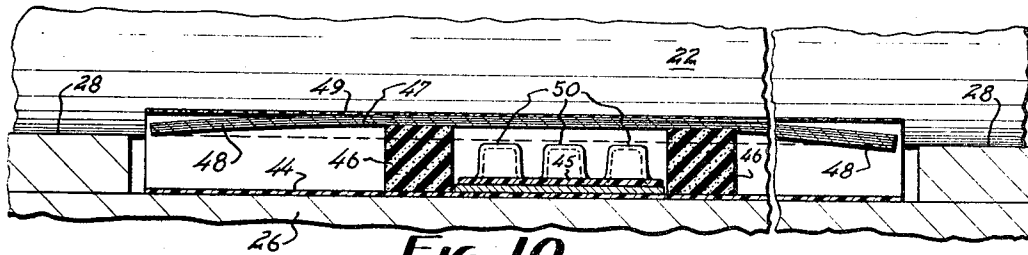


FIG. 10

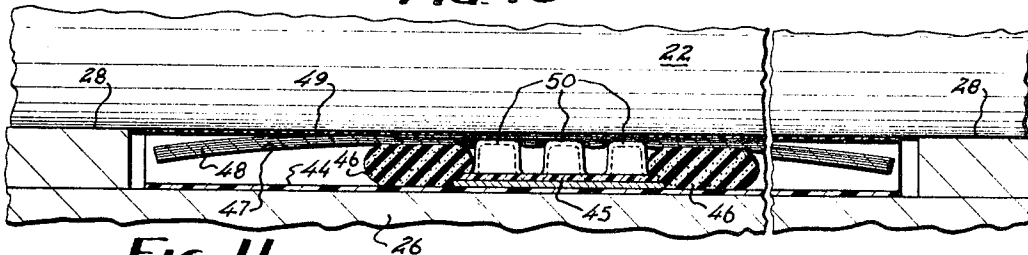


FIG. 11

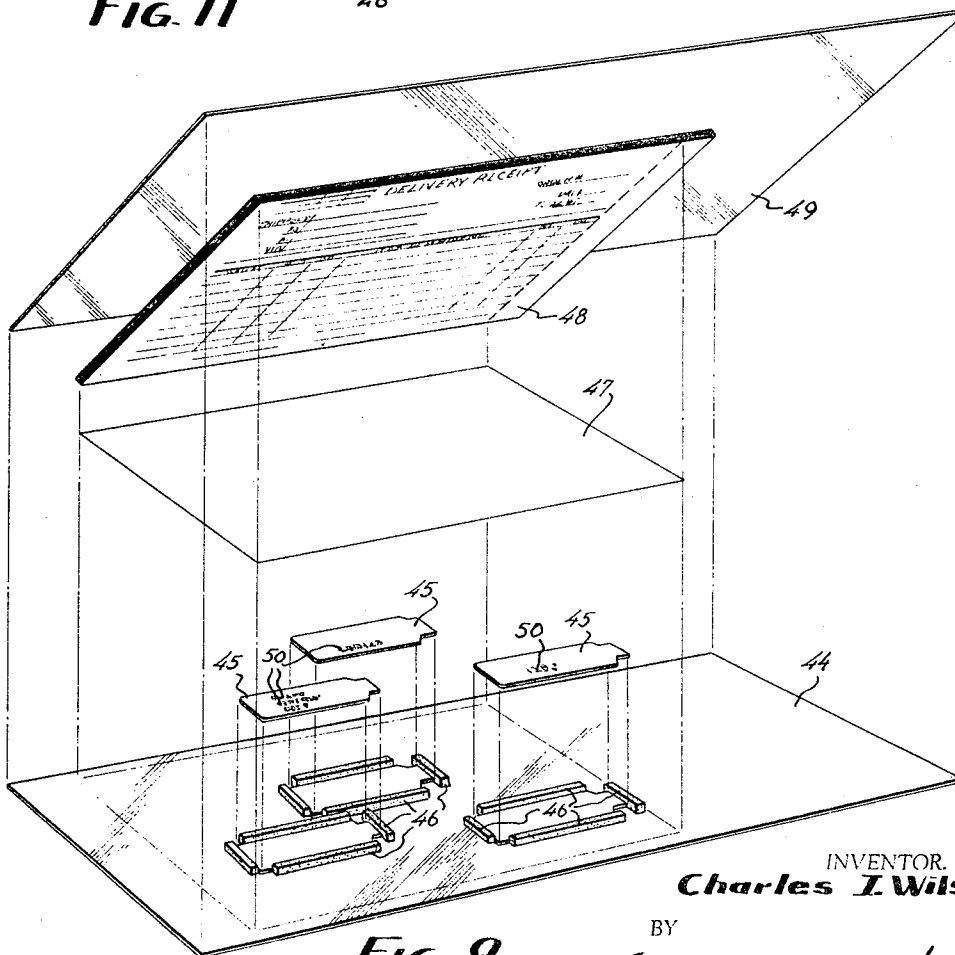


FIG. 9

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METHOD AND APPARATUS FOR SUPPLYING ADDITIONAL
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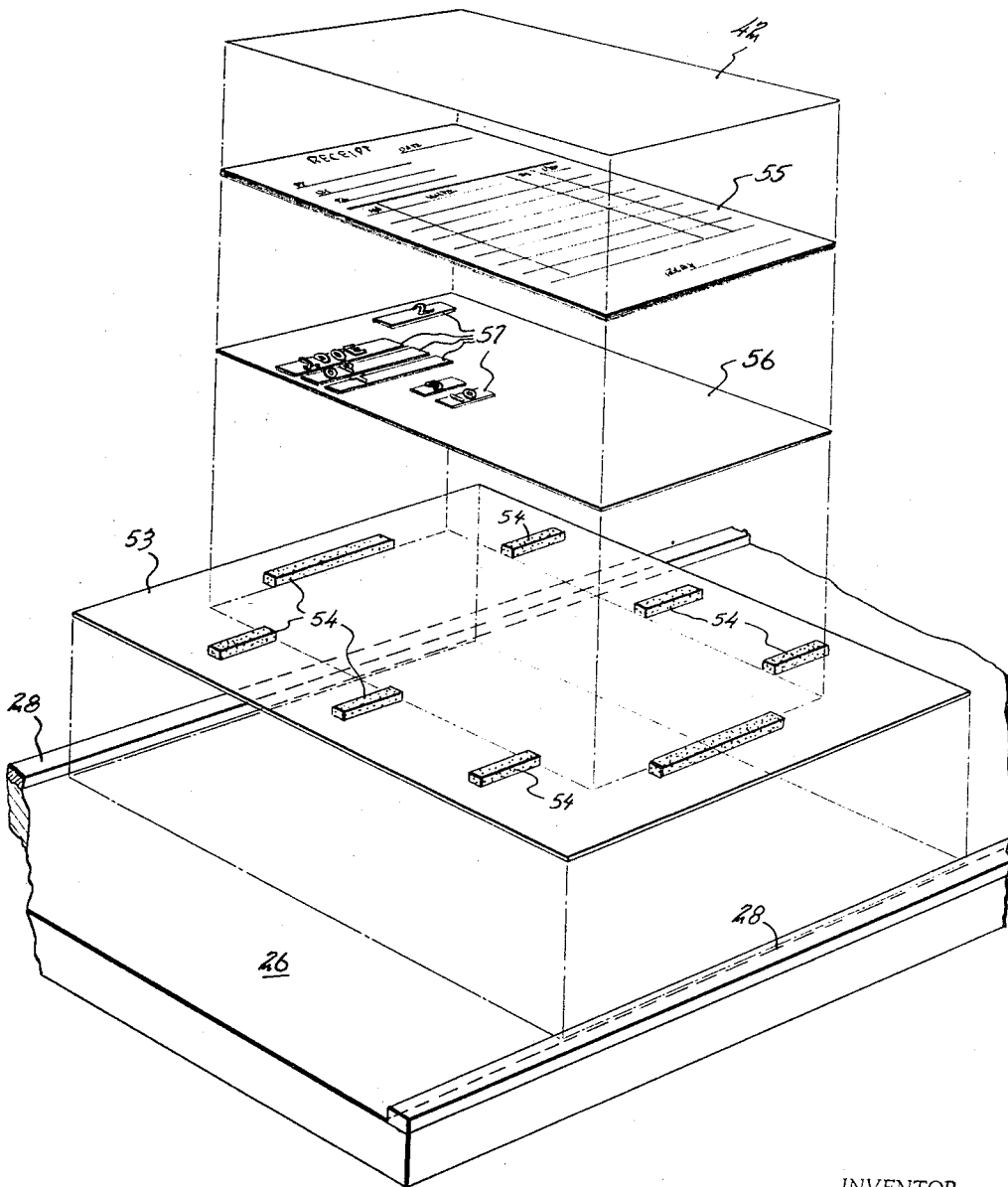


FIG. 12

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METHOD AND APPARATUS FOR SUPPLYING ADDITIONAL PRINTING TO PREPRINTED FORMS

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5 Claims. (Cl. 101—269)

This invention relates to an apparatus for providing additional printed data on preprinted business forms or other papers, particularly where large numbers of the same form must be supplied with the same information in the course of similar repetitive business transactions.

Practically all commercial activities require the use of one or more types of preprinted forms for recording various transactions involved in carrying on the business. For example, a manufacturer when shipping goods may utilize a form comprising a loading tally, a bill of lading and a delivery receipt for keeping track of the goods until they reach their destination. During a normal day's operation, an active business might use hundreds of forms to record all the various transactions. Yet, for many of the forms used each day, the information written on each form is the same or only slightly altered. Prior to the present invention, the common practice was to fill in each form separately by typing or handwriting the appropriate information. Not only was this procedure time consuming and costly from a labor standpoint, but such methods were inherently subject to errors and a rigorous checking procedure was required. Because of many slight variations in the information required to be filled in on the forms, it was not practical to preprint quantities of such forms by conventional methods. For example, although a certain form is used in large numbers for a group of customers it would not be practical or economical to preprint by the conventional printing methods small quantities of such forms with each having appropriate customer information.

Having the aforesaid fundamental problem in mind, it is therefore a principal object of the present invention to provide an apparatus which will enable papers such as partially preprinted forms to be printed rapidly and efficiently with additional material at desired preselected locations on the form. My device is particularly well adapted for printing additional matter on preprinted business forms comprising a plurality of sheets separated by a duplicating layer such as carbon paper.

Another object of the invention was to fulfill the aforesaid objective by a device that was portable and easy to operate by relatively unskilled labor, as well as being inexpensive to build and maintain.

Still another object of the present invention is to provide a form printing apparatus wherein the content of the printing being applied to a form can be quickly and easily altered, or removed completely, or relocated on the form as desired. This versatility solves the problem of processing rapidly and efficiently large numbers of forms of different types and sizes wherein each form may require certain variations with respect to the data being supplied to them.

In general, the present invention contemplates the use of a pressure producing device such as a roller or platen that is movable along a rigid base member having a planar surface. Positioned on the base member is a removable bed plate on which is mounted one or a series of information plates or print members having embossed or raised portions forming an arrangement of letters or numbers that comprises the appropriate printing for the form being used. Means are provided to position a preprinted form in a certain predetermined position on the bed plate so that the information plates

or print members are in register with preselected lines or spaces on the form being processed. The roller or pressure producing means is then actuated to create a uniform pressure on the form against the bed plate and cause pressure printing to occur on the form sheets that are adjacent carbon papers.

Another important object of the invention is to provide a means for retaining the aforesaid information plates or print members on the bed plate so these print members will be held firmly in position during the printing operation and yet can be easily removed when it is necessary to replace them with another member having different embossed printing. In accordance with the invention, this objective is accomplished by the use of a resiliently compressible material which serves as a retainer for the print members on the bed plate but which is yieldable to the platen or roller during its actuation.

A further object of my invention is to provide an apparatus of the general aforesaid arrangement wherein the pressure producing roller is free running and does not twist, yaw or jam during a printing cycle, thereby providing a smooth consistent application of pressure across the entire bed plate that produces a clear printing reproduction in appropriate spaces on the form.

Yet another object of my invention is to provide a pressure printing apparatus utilizing a transparent bed plate to which embossed flexible tape can be easily applied for use in printing various forms. With a sample form attached to the underside of the bed plate, such tape type print members can be easily attached to the upper surface of the platen at the proper locations.

Other objects, advantages and features of the invention will become apparent from the following detailed description presented with the accompanying drawings, in which:

FIG. 1 is a plan view of a pressure printing apparatus embodying the principles of the invention;

FIG. 2 is a view in elevation and partially in section of the apparatus shown in FIG. 1;

FIG. 3 is an end view in elevation and partially in section of the apparatus shown in FIGS. 1 and 2;

FIG. 4 is a fragmentary view in perspective showing a segment of embossed tape of the type used with the apparatus of FIGS. 1-3;

FIG. 5 is a view in elevation and in section taken along the line 5-5 of FIG. 4;

FIG. 6 is an enlarged view in elevation and in section taken along the line 6-6 of FIG. 2;

FIG. 7 is an enlarged view in elevation and in section showing the apparatus of FIG. 6 with the roller in the pressure printing position;

FIG. 8 is an exploded view in perspective showing the arrangement of layers, including the bed plate when pressure printing is accomplished with the apparatus shown in FIGS. 1-7;

FIG. 9 is an exploded view in perspective showing a modified form of the invention utilizing removable printed plates on a bed plate;

FIG. 10 is an enlarged view in elevation and in section showing the bed plate of FIG. 9 before the roller is moved to the pressure position;

FIG. 11 is a view in elevation and in section showing the bed plate of FIG. 10 with the platen roller in the pressure position;

FIG. 12 is an exploded view in perspective showing another bed plate arrangement embodying the principles of my invention.

With reference to the drawings, FIGS. 1-3 show an apparatus 20 embodying the principles of the invention. Broadly speaking, it comprises a fixed, rigid base assembly 21 and a pressure producing platen roller 22 movably at-

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tached thereto. Positioned on the central portion of the base assembly across which the roller moves is a generally planar bed plate 23. Retained on the bed plate are a series of embossed print members 24 having raised portions 25 in the shape of letters or numbers arranged in a desired sequence. The raised letter portions 25 of the embossed print members 24 and the bed plate 23 are substantially non-yieldable to pressure from the platen roller so that pressure printing can be accomplished on a paper placed on the bed plate as the roller is moved over it. Yet, in accordance with the invention, the print members 24 are easily removable from the bed plate so that the printing produced by the apparatus can be readily changed when necessary.

In the apparatus 20 the base assembly 21 includes a rectangular base board 26 to which may be attached a series of spaced apart rubber suction type feet members 27 adaptable to grip a plane surface such as a desk top. Attached to opposite sides of the base board 26 by screws or other suitable means are a pair of longitudinally extending rails 28 which support the ends of the roller 22. In the form of the apparatus shown, the rails 28 extend outwardly beyond the edges of the base board 26 to form an overhanging lip portion 29. As will be seen, the outer edges 30 of the rails 28 serve to guide the roller 22 and prevent it from yawing during a printing operation, while the inner edges 31 of the rails 28 serve as retaining means for the removable bed plate 23 which is thus positioned between them on the base board.

The platen roller 22 is cylindrical and has a bushing 32 fixed in each end, forming a bearing for an axle member 33. The ends of the roller 22 extend close to but are spaced slightly away from a pair of roller support members 34. The axle members 33 fit within and extend from the bushings 32 beyond the ends of the roller, and each axle is rigidly supported in an opening 35 of a support member 34. The openings 35 are slightly elongated along an axis perpendicular to the base board 26 and a set screw 36 extends through the upper portion of each bearing support member into each opening 35. Turning the set screws 36 provides a means for moving each axle 34 within an opening 35 and adjusting the position of the roller 22 with respect to the bed plate 23. Fixed to the end of each axle member 33 that extends through a roller support member 34 is a knob 37 that enables the roller to be easily controlled during operation of the apparatus. Rotatably attached near opposite lower corners of each roller support member 34 are a pair of spaced apart guide wheels 38. The latter are adapted to engage the underside of the overhanging lip portion 29 of the rails 28, thereby retaining the roller 22 as it is moved along during a printing operation. The two guide wheels 38 on each roller support member 34 are spaced apart on opposite sides of the perpendicular centerline of the opening 35. This arrangement provides excellent stability for the roller and helps it to maintain constant pressure on the bed plate as it moves along. At the same time, the outer edges 30 of the rails are in close proximity with the inside surfaces of the roller support members 34 and this prevents any tendency for the roller to twist or yaw during a printing cycle. While the aforesaid arrangement for mounting and actuating the roller 22 produces excellent results, it is to be understood that modifications thereof could be made within the scope of the invention. For example, the end knobs 37 could be replaced by a single central handle for actuating the roller.

As stated previously, the bed plate 23 fits between the rail members 28 on the base board but is unattached thereto and is removable. A sheet of cardboard or some other suitable material having a uniform thickness may be used as a shim 39 to raise the level of the bed plate 23 so that proper pressure can be applied by the roller when printing takes place. In operating the apparatus the bed plate 23 should be at the proper level between the rails so that the upper edges of the raised printing portions 25 of the em-

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bossed print members 24 are in substantially the same plane as the upper surfaces of the rails 28. The thickness of the rails will determine how thick the shim 39 should be since the rails support the ends of the roller. The optimum desired position of the raised letter portions 25 with respect to the plane of the rails 28 will also depend somewhat on the size or thickness of form being used, that is, how many pages and carbon pages it has. When the proper level of the embossed print members has been established by a shim of the appropriate thickness, an adjustment in the pressure actually applied by the roller 22 can readily be made by changing its position slightly either up or down by means of the set screws 36.

In the embodiment of FIGS. 1-8, the print members 24 are formed by embossing a flexible plastic tape having a bonded surface. Such tape, as shown in the enlarged views of FIGS. 4 and 5, is produced and sold commercially for various labeling purposes by Dymo Industries, Inc. of Berkeley, California, under the trademark "DYMO". The tape is provided with an adhesive backing so that it is readily applied to the bed plate after being appropriately printed. I have discovered that the embossed tape or print members 24 produce the best results when positioned lengthwise on the bed plate; that is, they should be substantially perpendicular to the direction of travel of the platen roller.

The bed plate 23 which fits on the base board 26 and which is retained between the rail members 28, is preferably made of a transparent material such as a sheet of celluloid or acetate of uniform thickness. Along the edges of the upper surface of the transparent bed plate 23 and elsewhere thereon, if desired (depending on the size of the form being processed), are attached some strips 40 of a resiliently compressible material such as a yieldable sponge-like foam rubber or foam plastic. These border strips 40, which are of uniform thickness, extend well above the level of the raised letter portions 25 on the print members 24 and are deformed by the platen roller 22 during a printing operation. In the embodiment of FIG. 1 the strips 40 deform and flow outwardly to bear against the inner edges 31 of the rails 28 when engaged by the roller, thereby serving to help hold the bed plate 23 firmly in position without any longitudinal or transverse slippage. The strips 40 may also serve as locating guides or retainers for the form being printed by the apparatus, or additional strips may be used for this latter purpose. A typical form is designated by numeral 41 in the drawings. When attached to the bed plate 23, the strips 40 are spaced apart a distance which is only slightly greater than the width of the form 41, so the latter can easily be placed on the bed plate 23 in the proper location to receive the additional printing.

The apparatus 20 can be adjusted to perform its printing function efficiently for various preprinted forms having from five to ten or even more sheets including the various carbons, or it will function equally as well with a form comprising only a single sheet. FIG. 8 shows an exploded view which illustrates how the bed plate 23 and the form 41 to be printed are arranged on the apparatus 20 before a printing operation according to the invention commences. The lowermost sheet shown in FIG. 8 is the shim sheet 39 which fits between the guide rails 28 of the base board 26, as shown in FIGS. 1-3. Located above the shim sheet is the bed plate 23 which also fits between the guide rails. On the upper surface of the bed plate are bonded the various print members 24 or strips of embossed plastic tape having the appropriate preformed lettering. These print members or print strips 24 are readily applied in the proper place on the bed plate by first placing a sample form 41a of the type to be printed on the underside of the transparent bed plate 23 to indicate where the print members should be applied to the upper surface of the bed plate. This procedure is shown in FIG. 1. Once this is done, it is not necessary to retain the form sample 41a with the bed

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plate 23, but it can be used in the same manner at a later date when changes or additions in the print members are to be made.

With the bed plate properly provided with the various print strips 24 and located in position between the guide rails 28 of the base board 26, a form 41 to be printed is placed right side up on top of the bed plate 23 and a piece of carbon paper 42 equal in size to the bed plate is placed with its sensitive side down on top of the form 41. Covering the aforesaid carbon paper 42, I may use another sheet 43 of semi-rigid acetate or cardboard in order to provide a smooth surface over which the roller can travel and to insure against any wrinkling of the carbon paper 42. The apparatus 20 is now ready to print the form 41, and this is accomplished by merely grasping the roller knobs or handles 37 and pulling it from one end of the base board 26 to the other. As the roller moves along, it applies a constant pressure across the form 41 and to the bed plate 23 below it having the raised print members 24. The platen roller pressure is sufficient to cause a clear carbon paper imprint on all the sheets of the form 41 and on the proper predetermined lines of each form sheet. FIGS. 6 and 7 show enlarged cross sectional views of the bed plate 23 and the form 41 thereon both before and during the application of printing pressure by the roller.

In FIGS. 9-11 is shown another embodiment of my invention wherein a modified form of print means is utilized. Again a bed plate 44 is provided, comprising a sheet of any suitable semi-rigid material, but here a non-transparent cardboard is not necessary. The print members 45 on the bed plate comprise a fairly rigid metal or plastic plate having pre-embossed letters of the appropriate content thereon. The embossed letters may be either normally arranged or reversed. These plates 45 are removably retained in predetermined locations on the bed plate 44 by means of deformable strips 46 of resiliently compressible material such as the same foamed plastic or latex material that was utilized for the border strips 38 on the bed plate 23.

Once the proper location of each print plate 45 on the bed plate 44 is determined, two pairs of strips 46 of the aforesaid resilient material are bonded to the upper side of the bed plate to form a border along the ends and sides of the print plates 45. These border strips 46 around each plate 45 serve to retain them in the proper predetermined positions on the bed plate surface without having to attach them permanently to the platen. When the bed plate 44 is prepared for use with a particular form, as shown in FIG. 9, it may be provided with several groups of resilient retaining strips for holding a number of print plates 45 at various predetermined locations thereon. To change the printing desired on a bed plate applying to a particular form, the appropriate plate is merely removed and replaced with another one.

If desired, some or all of the plates 45 on the bed plate 44 could be permanently fixed to the bed plate as by a suitable adhesive, but this greatly reduces the versatility of the apparatus. As shown, I prefer to permanently bond a plain plate 51 to the bed plate 44 at the desired location with the border strips 46 bonded around it. The plates 51 thus serve as shims and also fairly rigid base supports that make it easier to drop replaceable print plates in and out when required.

In using this latter embodiment of the invention, the bed plate 44 is placed in position between the guide rail 28 of the base board 26. Assuming that the plates 45 have reversed embossed lettering, a piece of carbon paper 47 is placed on top of it with its sensitive side up. The form 48 to be printed is then placed face down on the carbon 47 and a protective sheet member 49, if desired, may be placed on top of the form. The form 48 is now printed by moving the platen roller 22 from one end of the bed plate to the other as with the first embodiment.

The unique action of the roller 22 on the border strips

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26 around the removable print plates 45 is shown in FIGS. 10 and 11. In FIG. 10, before the roller pressure is applied, the compressible border strips 46 extend well above the plane of the embossed portions 50 of the print plates 45. When the roller advances, the pressure exerted thereby depresses and deforms the resilient strip members 46 so that they press against the edges of the print plates 45 and grip them tightly. This prevents any movement of the print plates during the printing procedure and provides sharp clear printing results on the form 48. The thickness and relative degree of resiliency of the border strips 46 is important in my apparatus in order to produce printed copies that have the sharp clear lettering without making extraneous marks or smudges on the forms. When the roller 22 presses the form 48 down against the bed plate 44 and the print plates 45 it simultaneously presses against the border strips 46. If the strips lack a sufficient resiliency they will become hard and cause an imprint on the form 48 due to the roller pressure. However, in accordance with the invention, the size and material of the strips 46 is such that when the full roller pressure is applied, the strip material is still not fully deformed, and thus its reactive force produced on the lower carbon paper adjacent the print plate or on other carbons within the form is not sufficient to create an unwanted mark on the form. As stated above, the material used for the border strips 46 in achieving this result may be the same material as that used for the edge strips on the bed plate 23, that is, a highly yieldable but resilient sponge or foam-like latex or plastic preferably having an outer skin portion. Such material is commercially available. In certain situations where reactive marks from the border strips persist due to the size of the form being printed, an additional shim plate can be dropped within the confines of the strips 46 below the regular print plate 45.

In another embodiment of my invention shown in FIG. 12, a bed plate 53 is provided having an overall width substantially equal to the distance between the edge rails such as the rails 28 on the base member 26. This bed plate 53 is thus held firmly in position when placed on the rigid base member of the apparatus. Attached to the upper surface of the bed plate 53 are a plurality of strip segments 54 of resiliently compressible material which is the same as that used for the members 40 and 46. These segments 54 are firmly bonded to the bed plate 53 and are located at intervals thereon to define a predetermined area equal in size and shape to the form 55 being processed. The segments 54 function like the members 46 and are arranged so that either their ends or sides are adjacent the boundaries of the aforesaid area. A sub-bed plate 56 having the same area as the form 55 to be processed is adapted to fit within the area defined by the surrounding segments 54 on the bed plate 53, and it is easily dropped in or removed therefrom. The segments 54, when compressed by a roller on the apparatus, deform and serve to grip the sub-bed plate 56 to prevent any movement that could blur the printing being added. The sub-bed plate 56 is preferably transparent, as the bed plate 23, and bonded to its upper surface are embossed print members 57 having the appropriate raised letters and numbers. The locations of these print members 57 can again be determined with the transparent sub-bed plate 56 by placing a sample form on the underside of it when the print members 57 are attached, as shown in FIG. 1. The print members 57 are in strip form and as stated previously it is preferable that these strips be located on a line parallel to the direction of travel of the roller. With the sub-bed plate 56 in place on the bed plate 53, the printing of the form 55 is accomplished in the same manner as previously described with respect to FIG. 8.

In use, the aforesaid embodiment of FIG. 12 is highly versatile and provides a means for handling many different sizes and types of forms with the ability to quickly

change the printed material that must be added. For example, in an office using my apparatus, a series of bed plates 53, each having the compressible segments 54 arranged to accommodate a particular form can be kept in stock. Then for each bed plate, a series of sub-bed plates 56 can be provided and classified as to customers or according to some other common description. Other changes on these sub-bed plates can be made easily when necessary by merely interchanging, removing or adding printed tape members 57.

From the foregoing it should be apparent that the present invention provides a relatively simple, but unique and highly efficient apparatus for press printing any desired additional material on preprinted forms or other matter. Using the well known plastic labeling tape, a bed plate can be quickly modified or supplied with whatever printed material is necessary. Such print members, being normal rather than reversed printing, are thus easy to understand and locate properly on the bed plate. Yet, I have discovered that such tape materials for my print members are durable and sufficiently rigid to make a clear carbon paper impression through several layers of paper in a normal business form. While somewhat less convenient, the metal print members 45 provide the same results and once the bed plate 44 has been supplied with appropriate resilient border strips 46, various plates can be easily dropped into position and can be removed and interchanged with other plates when the occasion demands.

My invention has solved serious problems concerned with and has greatly alleviated the time and labor heretofore required for producing the multiplicity of business forms required in many standard business procedures. In the shipping of manufactured products from a plant, for example, the present invention has greatly reduced or completely eliminated the need for typewriting or handwriting forms. In addition to the saving of time and labor, the accuracy and overall efficiency of form handling has been vastly increased, and checking or rechecking of forms produced with my apparatus is unnecessary.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. An apparatus for use in adding lines of printing and other indicia at predetermined locations to a preprinted form having a plurality of pages separated by pressure-sensitive sheets of duplicating material, said apparatus comprising:
 - a rigid base member having an upper planar surface;
 - a bed plate formed from a relatively thin sheet and retained on said planar surface of said base member;
 - a series of print plates removably retained on said bed plate at preselected locations thereon, each said print plate having a generally planar surface with raised portions extending above its surface, said raised portions forming a predetermined arrangement of letters or indicia;
 - resiliently deformable means of elastomeric material attached to said bed plate and located adjacent the edges of said print plates for holding said print plate in position upon pressure being applied to said form and to said means;
 - means for retaining a multiple page preprinted form in a predetermined fixed position on said bed plate and on said print plates;
 - and means for exerting a pressure on said form against said bed plate and said print plates so as to produce a printed impression on said form.
2. The apparatus as described in claim 1 wherein said resiliently deformable means comprise strips of porous elastomeric material bonded to the upper surface of said

bed plate and forming retaining pockets for said print plates, said strips being adapted to press inwardly toward an adjacent print plate when engaged by said pressure exerting means.

3. The apparatus as described in claim 2 including rail members fixed to opposite sides of said base member, said elastomeric strips of material for retaining said print plates normally extending above the level of said rail members when not under pressure and deformed to a level even with said rail members by said pressure exerting means, said elastomeric strips being still further compressible when under pressure by said latter means, whereby said strips do not cause a mark on the form being processed.

4. An apparatus for use in adding lines of printing and other indicia at predetermined locations to a preprinted form comprising:

- a rigid base member having an upper planar surface;
- a bed plate retained on said base member in a predetermined position;
- a sub-bed plate removably secured on said bed plate;
- a plurality of elongated members of resiliently compressible material fixed to the upper surface of said bed plate, said elongated members being arranged so that one side of each lies along a line defining an enclosed area on said bed plate, said area having the same size and shape as said sub-bed plate and the form to be processed;

a plurality of print members removably secured at predetermined locations on said sub-bed plate and having raised portions extending above its normally planar surface, said raised portions forming a preselected combination and arrangement of letters or indicia;

means for retaining a multiple page preprinted form on said sub-bed plate, said print members being located in predetermined fixed positions on said sub-bed plate so that its raised portions are in register with appropriate areas on a form having the same size and shape as said sub-bed plate;

and means connected to said base member for applying pressure to the form retained by said elongated compressible members to press the form against said print members so as to produce a printed impression on said form.

5. An apparatus for use in adding lines of printing and other indicia at predetermined locations to a preprinted form, comprising:

- a rigid base member having an upper planar surface;
- a bed plate retained on said base member in a predetermined position;
- a sub-bed plate removably secured on said bed plate;
- a plurality of elongated members of resiliently compressible material fixed to the upper surface of said bed plate, said elongated members being arranged so that an end or side of each lies along a line defining an enclosed area on said bed plate, said area having the same size and shape as said sub-bed plate and the form to be processed;

a plurality of flexible tape print members bonded at predetermined locations to said sub-bed plate and having raised portions extending above its normally planar surface, said raised portions forming a preselected combination and arrangement of letters or indicia;

means for retaining a multiple page preprinted form on said sub-bed plate, said print members being located in predetermined fixed positions on said sub-bed plate so that its raised portions are in register with appropriate areas on a form having the same size and shape as said sub-bed plate;

and means connected to said base member for applying pressure to the form retained by said elongated compressible members to press the form against said

print members so as to produce a printed impression
on said form.

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