

[54] METHOD OF PRODUCING WEB UNITS

[76] Inventor: James B. Fulk, P.O. Box 947, Los Gatos, Calif. 95030

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[51] Int. Cl. B65h 41/00

[58] Field of Search 270/1, 5, 6, 10, 18, 52, 270/53; 101/226-228, 426

[56] References Cited

UNITED STATES PATENTS

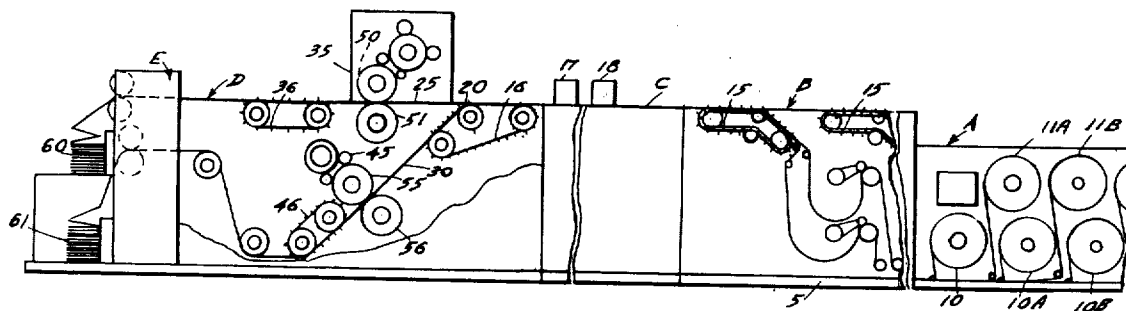
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Primary Examiner—Edgar S. Burr
 Assistant Examiner—William Pieprz
 Attorney, Agent, or Firm—Teare, Teare & Sammon

[57] ABSTRACT

A method and apparatus for making graphic copies of indicia, lines or designs on superimposed multiple paper parts. The multiple paper parts or webs are pulled by pinned belts for gathering in superimposed relationship and for processing in unison such as file hole punching, and cross perforating and then the parts are separated into and pulled into at least two paths or sections, wherein the parts of each section are processed such as by "crash printing," independently of the parts of the other section, and then the two sections are folded or cut independently of each other so as to make separate stacks of forms. The method and apparatus permits the simultaneous processing, such as printing, of two sets of dissimilar forms on superimposed multiple webs while both sets are processed and moved continuously in unison through a press.

7 Claims, 5 Drawing Figures



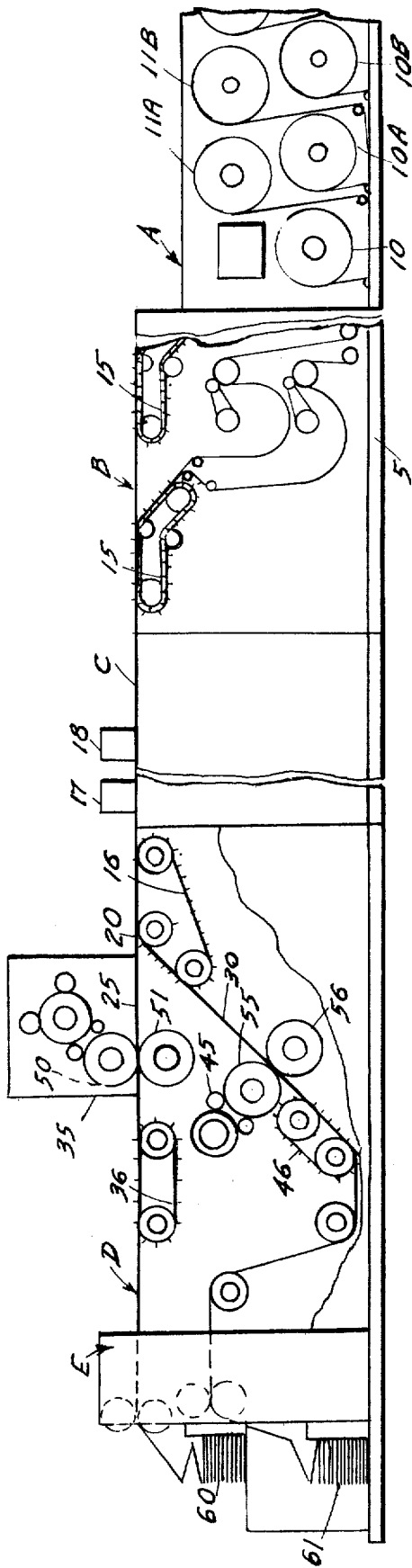


Fig. 1

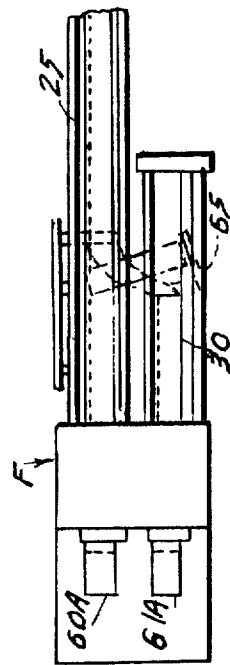
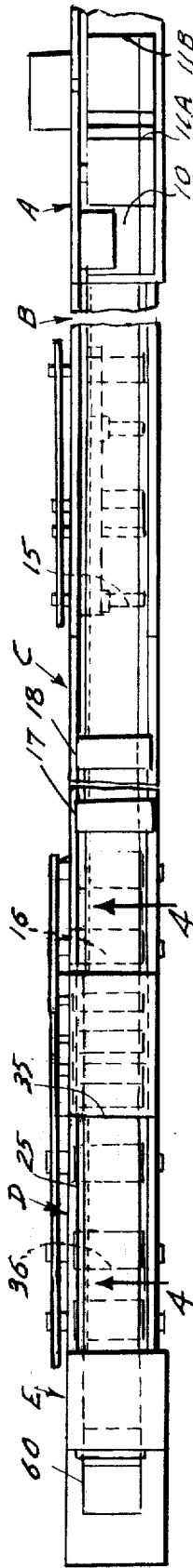


Fig. 3

Fig. 2

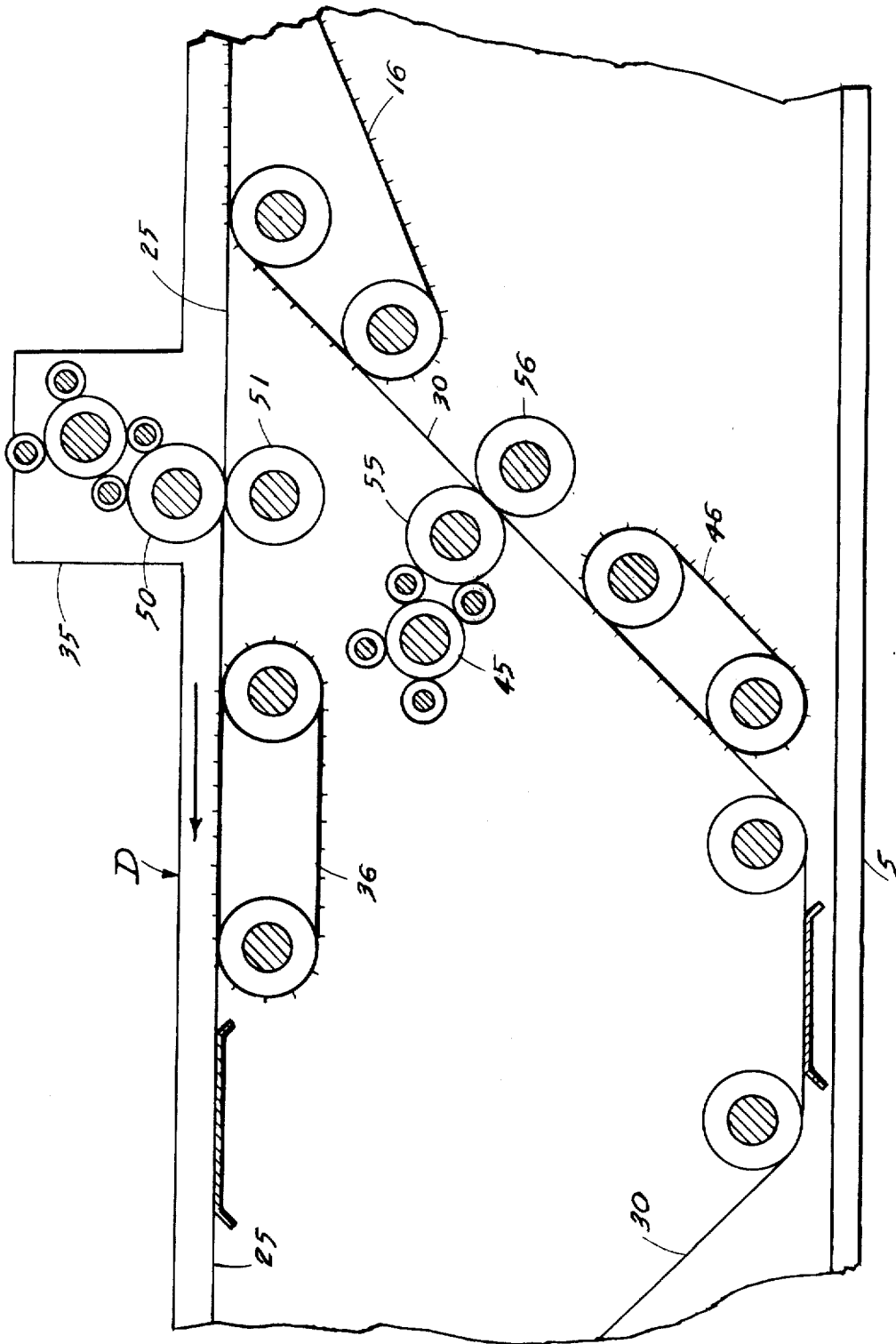
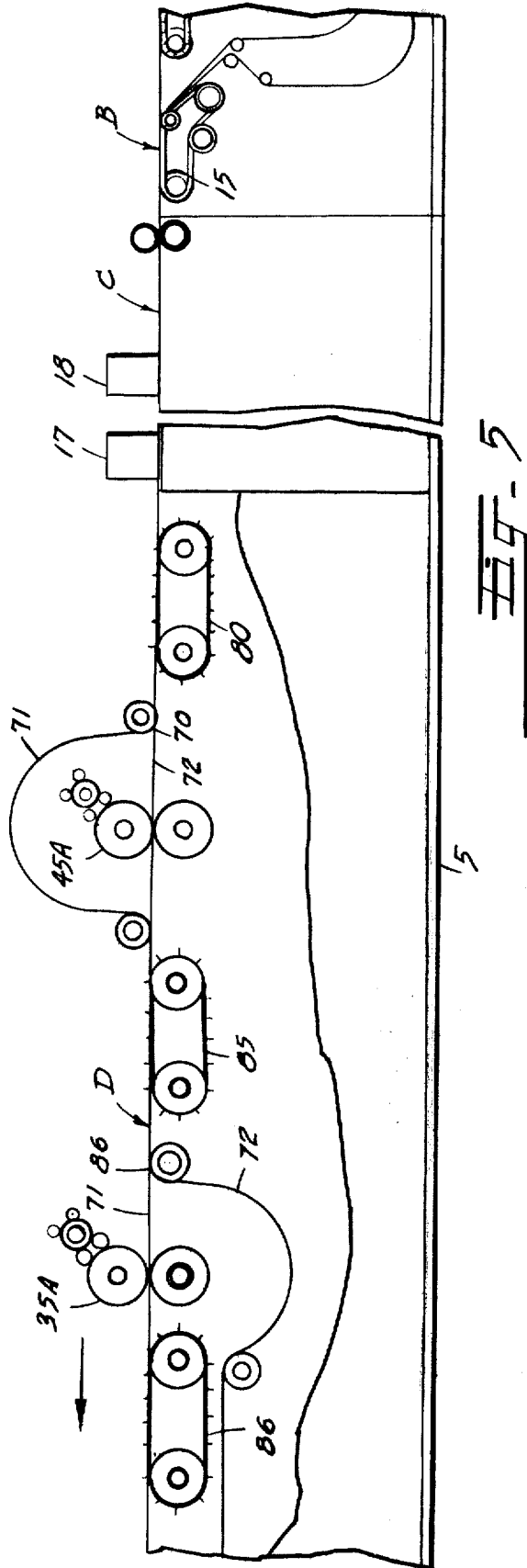


Fig. 4



METHOD OF PRODUCING WEB UNITS

BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for making graphic copies of indicia lines or designs on superimposed multiple paper parts by what is known in the art as "crash" printing.

The term "crash" printing, as used herein, refers to the act of printing, wherein the webs are subjected to great pressure while positioned between a hard printing plate and a hard impression plate.

United States patents showing prior methods and apparatus for printing on superimposed multiple webs are patents which have been issued to me as U.S. Pat. Nos. 3,069,155, 3,640,220 and 3,672,299. Such printing methods as disclosed in the aforesaid patents do not permit the running of two different jobs, each on multiple part webs at one time, where the graphic copies include indicia or designs.

One of the difficulties in "crash" printing on multiple part webs has been the maintenance of sufficient accuracy at very high speed under "tight" tolerances, because the end product is used in extremely sensitive and sophisticated machines, such as computer-printers. Moreover, the webs comprise stretchable material which is highly sensitive to humidity, temperature and rough handling.

It is desirable, however, to be able to print two different jobs at one time and yet to attain the foregoing end product on superimposed multiple webs without diminishing the speed at which the press is capable of operating, and within the tolerances which are acceptable for such type of printing operation.

SUMMARY OF THE INVENTION

The present invention contemplates a method and apparatus which overcomes the foregoing difficulties, particularly where a large number of superimposed webs are printed at relatively high speed. The method of the present invention is accomplished as, for example, upon an eight-part web, by pulling all of the webs in unison by pinned belts through one or more processing operations, such as file hole punching, and cross-perforating, wherein the pins engage a row of holes extending longitudinally of the webs and adjacent the marginal edges thereof. After the webs have been so processed in unison, they are separated into two sections, one of which, for example is the upper four-part section and the other of which is the lower four-part section, each of which is printed independently of the other. The separate sections are then pulled into folders where they are zigzag folded into separate stacks, or into cutting devices where they are separated into single set forms, or, if desired, one section may be folded and the other may be cut into single set forms.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is a front elevation, partly in section taken longitudinally through an assembly which embodies the present invention;

FIG. 2 is a top plan view of the assembly of FIG. 1;

FIG. 3 is a top plan view of a modified form of web folders;

FIG. 4 is a vertical section taken on a plane indicated by the line 4—4 of FIG. 2 but shown on a scale larger than that of FIG. 2; and

FIG. 5 is a front elevation, partly in section of a modified form of the assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The assembly shown in FIG. 1 is illustrative of one form by means of which the invention may be carried out. In such illustration rolls 10, 10A and 10B of paper together with rolls 11A and 11B of carbon paper mounted in unwind position on a unit which is designated A at one end of the assembly. The paper rolls have been prepunched with a row of regularly spaced holes along at least one edge thereof on a machine which is different from that which forms the present invention, and the rolls are usually stored for subsequent future selection in accordance with the requirements of a customer for multiple part forms as to color, size and weight.

The machine which is illustrated somewhat diagrammatically in FIG. 1 has a base 5 which at the right hand end, as viewed in FIG. 1, supports as many rolls of paper as are needed for making the desired number of parts to a set. For purpose of illustration, three rolls designated 10, 10A and 10B comprise prepunched paper webs while the rolls 11A and 11B comprise rolls of transfer material, the webs of which are intended to be interleaved between the paper webs. The use of carbon webs, however, is optional, because a substrate can be provided with carbonless forms as is well known in the art.

The webs are pulled from the respective rolls into a gathering unit, designated B, by pinned belts 15, it being understood that there are as many pinned belts arranged in tandem as there are webs to be used in any predetermined maximum set of forms. The pinned belts maintain the webs in superimposed position as they travel to the left in FIG. 1.

As the webs leave the gathering unit B they are pulled through a processing unit C, as by a pinned belt 16 on a printing unit which is designated in general by the letter D. In the processing unit C the webs are acted upon in unison by such equipment as may be desired as, for example, a file hole punch 17 or a cross-perforator indicated in general at 18, but it is to be understood that other processing may be performed at unit C as desired.

After the webs leave the processing unit C and are pulled into the printing unit D they are separated into two paths, or sections, at the point 20 into what may be designated as an upper section 25 and a lower section 30. For example, if an eight-part web is being processed then the top section 25 may contain four webs, while the lower section 30 may contain four webs.

The webs of the section 25 are pulled through a printing unit designated in general at 35 by a pinned belt 36, while the webs of the lower section are pulled through a printing unit designated 45 by a pinned belt 46.

The printing unit 35 has a rigid inking roller 50 and a rigid impression roller 51 between which the webs of the top section are passed. Sufficient pressure is exerted upon the webs by adjusting the proximity of the rolls 50 and 51, so that the top web is printed with ink but the underlying webs are crash printed by means of the substrate between the respective webs.

In like manner, the webs of the lower section 30 which move downwardly on an inclined plane pass between a rigid inking roller 55 and a rigid impression roller

ler 56, whereby the top web of the lower section is printed with ink but the underlying webs are crash printed by means of the substrate between the respective webs. The space between the rolls 55 and 56 is adjustable, in a manner which is well known in the art.

As shown in FIGS. 1 and 2, after the webs of the upper section have been processed through the unit D, they are pulled through a folder, which is designated E and are formed into a zigzag stack 60. Similarly, the webs of the lower section after being processed in the unit D are pulled through the folder E and folded into a zigzag stack designated 61.

In FIGS. 1 and 2 the stacks 60 and 61 are positioned one above the other, but in FIG. 2 the folder F is arranged to fold the stacks 60A and 61A in side-by-side relationship. This is accomplished by moving the lower section laterally between the units D and E, as shown at 65 in FIG. 3.

An advantage of the present invention is that whenever the demand for a multiple part set is materially less than that for which the assembly is capable of producing, another multiple maximum part set can be processed simultaneously thereby materially reducing the cost of production. Thus, for example, on an assembly which is capable of processing eight-part forms, two jobs of four-part forms each can be processed simultaneously, thereby doubling the production of the assembly. Moreover, the indicia or designs of one four-part set could be identical to or dissimilar from the indicia and designs of the other four-part set.

In FIG. 5 a modification of the assembly is shown wherein like parts are designated with like reference characters. Thus, the webs are pulled from the supply rolls (not shown in FIG. 5) through the gathering unit B and the processing unit C and into the printing unit D. In the printing unit, the webs are separated at point 70 with the upper section 71 being looped over a printing unit 45A which processes the webs of the lower section 72 in the manner set forth for the printing of the lower section in FIG. 1. As indicated in FIG. 5 the webs are pulled into the unit E by the pinned belt 80 and are pulled over and through the printing unit 45A by a pinned belt 85. After leaving the pinned belt 85 the webs are again separated with the upper section 71 being pulled by pinned belt 86 through a printing couple 35A which prints the webs of the upper section in the manner heretofore described in connection with the printing unit 35 of FIG. 1. At the point 86 the webs of the lower section 72 are looped downwardly and thence are pulled horizontally with the webs of the upper section into folders of the type described at either E or F of FIGS. 1 and 3 respectively.

The pinned belts of FIG. 1 are operated at the same speed, and the pinned belts of FIG. 5 are operated at the same speed by electric motors (not shown).

By pulling webs from one station to another by means of pinned belts accurate control of the movement of the webs is maintained, and the assembly can be effectively operated at maximum speed without loss of register during the entire path of travel of the webs through the machine.

I claim:

1. A method of making graphic copies of indicia on multiple paper webs in a continuous operation comprising,

providing multiple paper webs with a substrate of pressure responsive marking material between adjacent webs,

pulling the webs into assembled superimposed contiguous relationship,

processing all of the webs simultaneously while they are moving in superimposed contiguous relationship, all of said superimposed webs being identically processed by said processing operation,

separating the assembled webs into an upper section and a lower section, each containing a plurality of superimposed contiguous webs,

moving the webs of the upper section as a unit in an upper first plane,

moving the webs of the lower section as a unit in a lower second plane,

crash printing the webs of the upper section simultaneously while they are moving continuously in said first plane, each of said webs of the upper section being identically imprinted by said continuous printing operation,

crash printing the webs of the lower section simultaneously while they are moving continuously in said second plane, each of the webs of the lower sections being identically imprinted by said continuous imprinting operation, each of said imprinting operations on said lower web section occurring substantially directly beneath the imprinting operation of the upper web section and

processing the webs of the respective sections as independent units into separate stacks.

2. A method according to claim 1 comprising processing the webs in unison after the pulling step but before the separating step.

3. A method according to claim 1 comprising printing indicia on the uppermost web of each section with ink, and

simultaneously utilizing the substrate for transferring the identical indicia on each upper web to the associated underlying webs.

4. A method according to claim 1 comprising, moving the webs of the upper section in a horizontal plane during the printing operation, and

moving the webs of the lower section downwardly on an inclined plane after the separating operation,

printing the webs of the upper section while they are moving in a horizontal plane and

printing the webs on the lower section while they are moving downwardly on the inclined plane.

5. An apparatus for making graphic copies of indicia on multiple paper webs in a continuous operation comprising,

a base, means for supporting the paper webs on separate rolls at one end of the base,

a web assembling unit, a web processing unit and a web printing unit supported on said base,

means on the base for pulling the webs off the rolls and moving them into superimposed contiguous relationship onto the assembling unit,

means for pulling the webs in unison from said assembling unit through said processing unit,

means mounted on the base for identically processing each of the superimposed webs in unison while they are moving as a unit through the processing unit,

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means on the base for moving the webs of one section as a unit in a first plane,
 means on the base for moving the webs of the other section as a unit in a second plane,
 means on the base for printing identical indicia on the webs of the first section by crash printing,
 other means on the base for printing identical indicia on the webs of the second section by crash printing, said second printing means being substantially directly beneath the first printing means
 means on the base for pulling the sections through the respective printing means,
 means on the base for assembling the printed webs of

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the respective sections into separate stacks, and means for operating all of said pulling means at the same speed.
 6. An apparatus according to claim 5, wherein the printing means operates to print the webs of the respective sections independently of each other by crash printing.
 7. An apparatus according to claim 5, wherein the webs of the upper sections are printed while moving in a horizontal plane, and the webs of the lower section are printed while moving on an inclined plane.

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