

Jan. 31, 1967

E. D. NYSTRAND

3,301,111

VERTICAL DELIVERY OF FOLDED WEBS

Filed April 10, 1964

3 Sheets-Sheet 1

FIG. 1

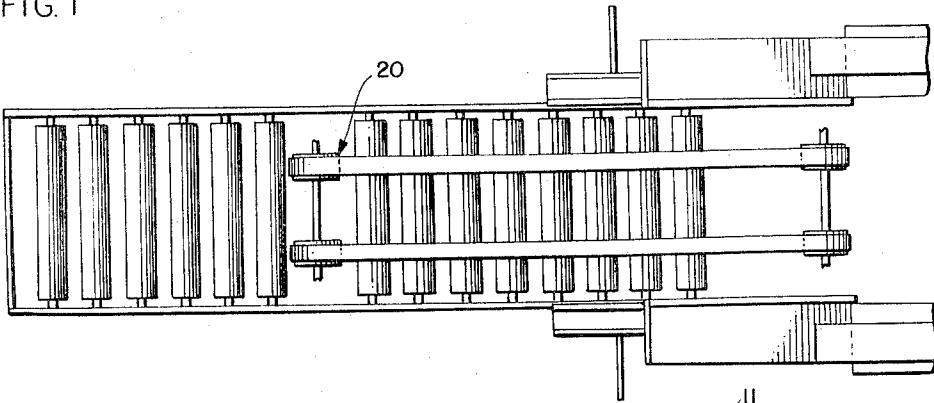


FIG. 2

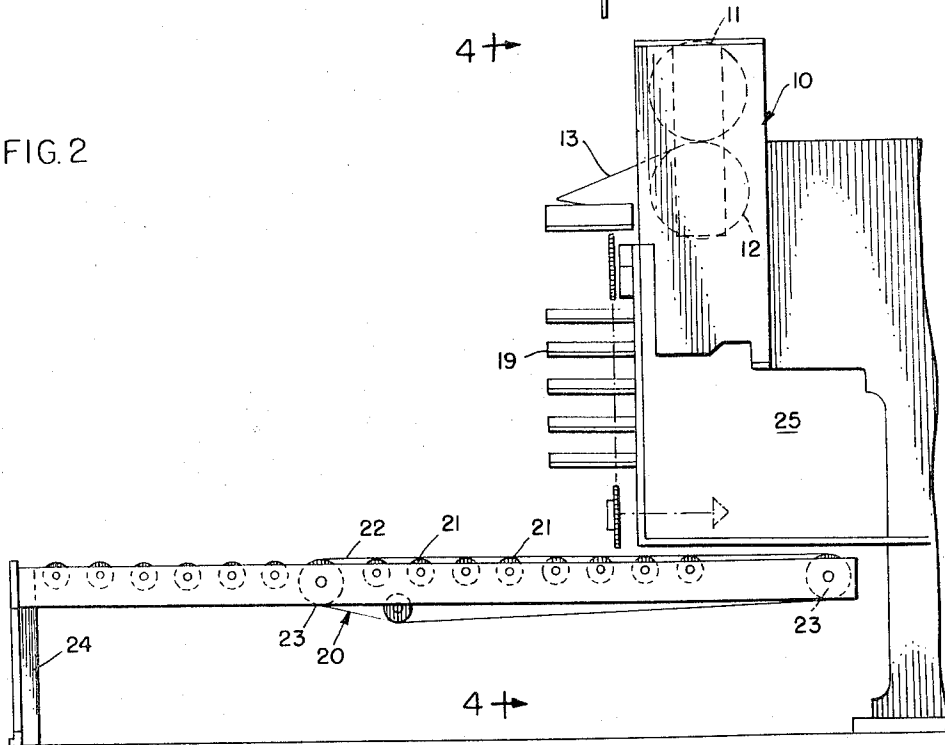


FIG. 3

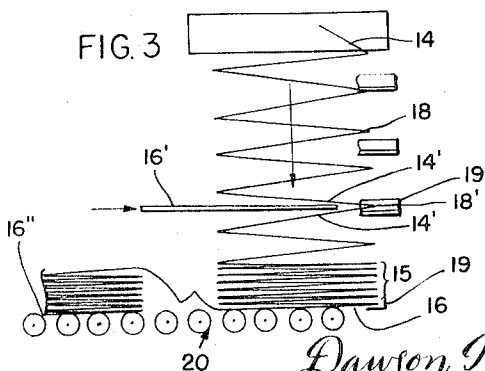
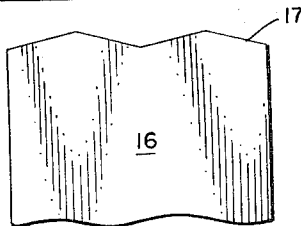


FIG. 6



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3 Sheets-Sheet 2

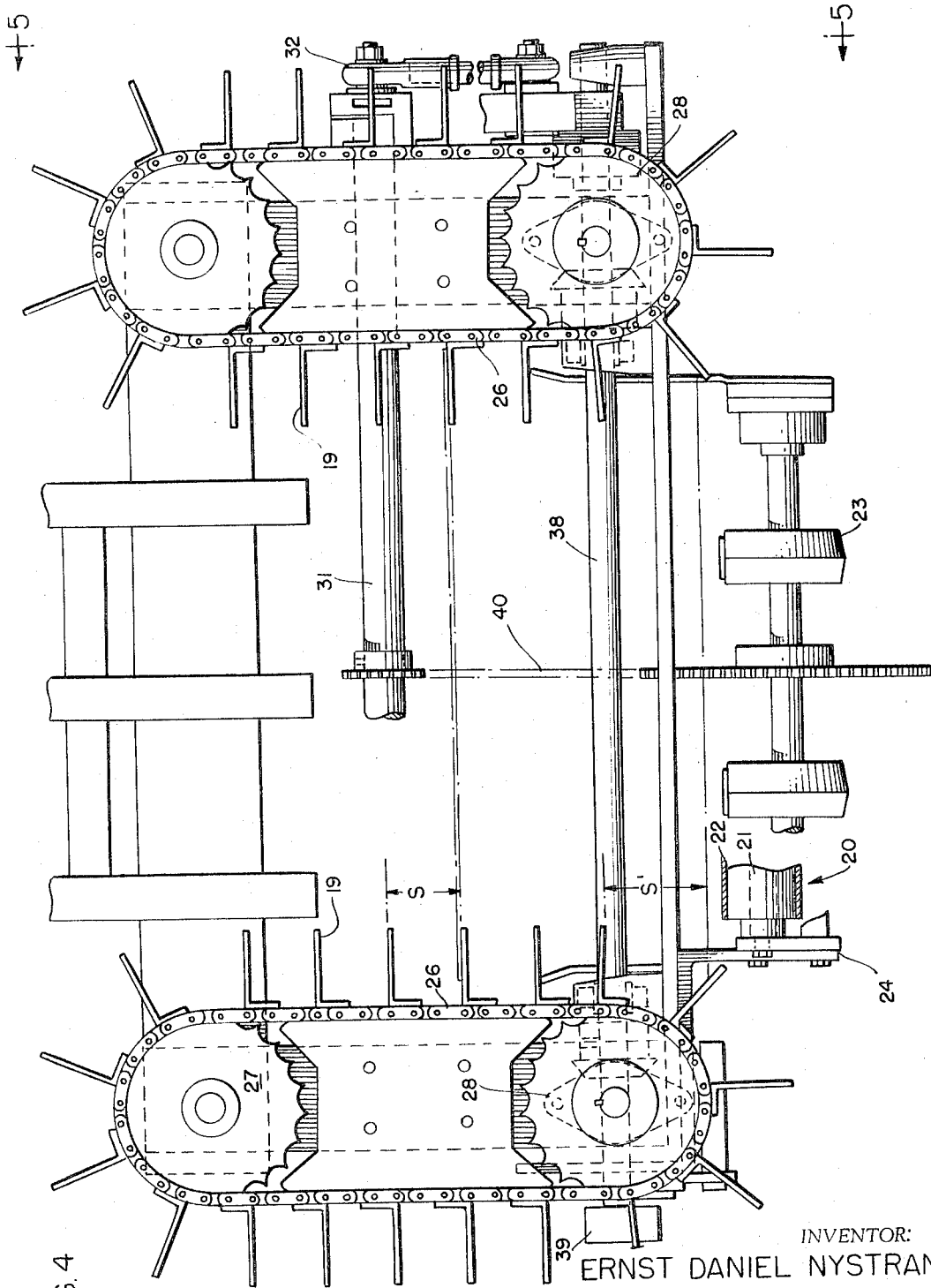


FIG. 4

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**VERTICAL DELIVERY OF FOLDED WEBS**

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3 Claims. (Cl. 83—92)

This invention relates to the vertical delivery of folded webs, and, more particularly, to apparatus and a method for handling a web which is reversely folded on itself at spaced points in the fashion of a zigzag fold.

The instant invention finds utility in connection with the folding apparatus described in my copending application, Serial No. 305,244, filed June 16, 1963 and now Patent No. 3,195,882.

The invention here, as well as that set forth in the just-referred-to application, is especially suitable for the handling of multiple copy paper. Such paper is widely used commercially, and features a plurality of sheets interleaved with carbon paper, and provided in a considerable length, folded in zigzag fashion. It will be appreciated that such multiple copy paper is quite heavy and has a tendency to compact, so that the production of such paper involves problems in transfer—particularly following the folding operation. Heretofore, this has required manual labor, which became inefficient because of the need to work with relatively small lengths of the multiple copy paper—due to its weight per unit length.

This is all solved according to the instant invention, wherein a novel arrangement of conveying means with web-supporting plates eliminates the need for manual lifting and shifting of the folded multiple copy webs. The provision of such a combination therefore constitutes an important object of the invention.

Another object of the invention is to provide a novel procedure in the art of handling zigzag folded sheets and wherein novel plates are employed to handle a zigzag folded web during the course of its travel in a vertical path.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in this specification.

The invention is explained in conjunction with an illustrative embodiment in the accompanying drawing in which—

FIG. 1 is a top plan view of apparatus embodying the teachings of this invention;

FIG. 2 is a side elevational view (in fragmentary form) of the apparatus of FIG. 1;

FIG. 3 is a diagrammatic or schematic view of a web traveling downwardly and which corresponds essentially to the showing in FIG. 2;

FIG. 4 is an end elevational view such as would be seen along the sight line 4—4 of FIG. 2;

FIG. 5 is a fragmentary elevational view such as would be seen along the sight line 5—5 applied to FIG. 4; and

FIG. 6 is a plan view of a cutter bar advantageously employed in the practice of the invention.

In the illustration given and with particular reference to FIG. 2, the numeral 10 designates generally the frame of a machine for producing web materials such as the zigzag folded multiple copy form paper previously referred to. The frame 10 is seen to carry a pair of folding rolls 11 and 12, which may be constructed according to the showing in my previously-filed, copending application, Serial No. 305,244, filed June 16, 1963.

In any event, the folding rolls or equivalent are employed to produce a zigzag or Z-fold such as is illustrated in FIG. 3. The web 13 issuing from the folding rolls is continued at 14 in FIG. 3 and is seen to extend downwardly until a condensed segment or portion 15 is

found supported on a plate 16. The plate 16 is seen in plan in FIG. 6.

The operation of the inventive apparatus in general includes the use of two or more supporting plates 16. For example, in FIG. 3, the zigzag pattern of webbing coming down at 14 is about to be interrupted by means of a second plate 16' shown in the process of being inserted between adjacent folds 14' and 14''. It will be seen that the cutting plate 16 may be equipped with a sharpened edge which may assume the "W" outline pictures at 17, and this makes possible the severance of the fold or crease of the web defined by the line of potential severance extending between the folds 14' and 14''. In practice, the web 13 is transversely perforated or equipped with lines of weakness along the fold lines as at 18.

The action of inserting the plate 16' results in a discrete stack or segment of web material, as is indicated partially by the numeral 15. Thereafter, the plate 16' develops a compressed stack of Z-folded material being carried downwardly on a flange as at 19 and which may be seen in greater detail in FIG. 4. If the web is unsevered, it may be carried away on the conveyor 20—as on the plate 16''.

Once the web has been separated as at 18' in FIG. 3, the plates 16' and 16'' can be removed from the vertical path without interfering with the further delivery of the web material 13. It is advantageous to perform this function through the provision of a horizontally travelling conveyor such as is generally designated 20 in FIG. 2.

Referring now to FIG. 4, it is seen that the conveyor generally designated 20 includes a plurality of idler rolls as at 21 (see also FIG. 2), on which is supported a belt 22. The belt 22 is driven by suitable crown rolls or wheels 23 mounted on a frame extension 24.

In FIG. 2, a second frame portion designated 25 is seen to be positioned below the frame 10 carrying the folding rolls 11 and 12. The frame portion 25 can be seen on enlarged scale in FIG. 5, and in FIG. 5 the means for adjusting the speed of travel of the various flanges is pictured.

Referring now, however, to FIG. 4, it will be seen that each flange 19 is provided as part of an endless chain 26—two such chains being provided. The chains 26 are entrained about sprockets 27 and 28, which are seen to be rotatably mounted in the frame portion 25. Now referring to FIG. 5, it will be seen that the sprocket 27 is carried by a shaft 29 which is rotatably mounted in a bearing 30, the bearing 30 being bolted to the frame portion 25, as shown in FIG. 5.

In operation, the web material proceeds intermittently downwardly in a vertical path, as shown in FIG. 3, and at the time that the plate 16 is deposited on the conveyor belt 22, there is a substantial spacing S' appearing between adjacent flanges 19, as compared with the ordinary spacing S. This extra spacing insures that there will be no interference adjacent plates, even though the material is compacted therebetween.

Means for advancing the chains intermittently (via powering the sprockets 28) include a main power shaft 31 (see FIGS. 4 and 5). The shaft 31 is suitably rotated by the motor (not shown) associated with the rest of the apparatus—i.e., folding rolls 11 and 12, etc. The shaft 31 is equipped with a crank 32 to develop an oscillatory motion (see the arrow 33 in FIG. 5) in the arm 34. The amplitude of movement is determined by the position after connection 35 in the slot 36. This develops a ratchet like action on the overrunning clutch 37 (FIG. 5) mounted on the cross shaft 38 (FIG. 4). Additionally by a brake 39 is coupled to the shaft 38 to prevent the weight of the stacked, folded web from overpowering the chain and sprocket system 26—28. Also, the output conveyor 22 is driven by a chain and sprocket system 40.

3

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of illustration, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In vertical delivery apparatus for multiple copy forms, and the like, a frame, means on said frame for delivering a Z-folded web in a generally vertical path, an endless conveyor on each side of said path disposed for movement in a generally vertical plane, each conveyor being equipped with a plurality of laterally-extending flanges, a horizontally traveling conveying means positioned at the bottom of said path, and a plurality of plates insertable in said web to separate the same and support a stacked web portion thereon when carried by said flanges, each conveyor being equipped with sprocket means adjacent said conveying means whereby adjacent flanges are spaced further apart at the time of transfer of said plates to said conveying means than during vertical travel of said flanges, each plate being equipped with a longitudinally-extending cutting edge, said cutting edge having a central projection.

4

2. The apparatus of claim 1 in which said cutting edge is generally W-shaped in plan.

3. In vertical delivery apparatus for multiple copy forms, and the like, a frame, folding roll means on said frame for transversely folding and thereafter delivering a Z-folded web in a generally vertical path, an endless conveyor on each side of said path disposed for movement in a generally vertical plane, each conveyor being equipped with a plurality of laterally-extending flanges, a horizontally traveling conveying means positioned at the bottom of said path, and a plurality of plates insertable in said Z-folded web to separate the same and support a stacked web portion thereon when carried by said flanges whereby said plates are insertable sequentially into said path without disturbing the alignment of said web.

#### References Cited by the Examiner

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WILLIAM S. LAWSON, *Primary Examiner.*