ABSTRACT: In an apparatus for the printing and scoring of blanks of sheet material for folding into boxes, a turnover device is positioned between the printing and scoring sections. The turnover device comprises a pair of axially spaced discs fixedly mounted upon a rotatable shaft disposed in substantially a horizontal plane. On the inner face of each disc, there is a plurality of equally spaced radially extending ribs with the ribs on the respective discs facing each other. On one side of the shaft, there is positioned a pair of endless belts which move blanks horizontally into positions between the opposed ribs. The discs are rotated in a direction upwardly from these belts to deposit the inverted blanks on a similar pair of endless belts positioned between the discs on the other side of the rotatable shaft. The belts are perforated and a suction is created through the upper reaches of the belts to retain the blanks thereon.
The invention relates to cardboard box forming machinery and particularly to an arrangement for turning over flat blanks between operations thereon. Boxes used as containers for a wide variety of goods are commonly formed from sheet materials such as paper, corrugated cardboard and the like. In general, the process for forming such a box comprises first cutting a blank from suitable sheet material, feeding or positioning the blanks, and the blank is then scored and folded to be assembled into a container into which the goods can then be placed. Such processes are generally continuous and carried out at a high rate of speed. During the process, the printing is applied to one side of the blank and the blank is scored on its other side for folding in such a manner that the printed material is on the outside of the assembled container. Therefore, after the blank has been printed, it must be inverted before being fed into the scoring apparatus. Various forms of devices have been proposed for inverting the blanks after printing so that they may be fed into the scoring apparatus with the printed face being directed downwardly. Such devices have been generally unsatisfactory since they have been complicated in structure and unreliable in operation, particularly at high speeds of production. The inverting devices were generally not always capable of performing at high production speeds and either malfunctioned or failed to invert all of the blanks received from the printing section of the apparatus.

One of the objects of the present invention is to provide an improved turnover device in an apparatus for the printing and scoring of blanks of sheet material for folding into boxes. Another of the objects of the present invention is to provide such a turnover device which is simple in construction and reliable in operation.

According to one aspect of the present invention, the turnover device may comprise a rotatable shaft disposed in substantially a horizontal plane. A pair of axially spaced coaxial discs are mounted on the rotatable shaft. The discs may be adjustable relative to each other so as to accommodate various width blanks. The inner face of each of said discs is provided with a plurality of equally spaced radially extending ribs. The ribs on one disc are aligned and opposed to the ribs on the other disc. The outer ends of the discs terminate short of the peripheral edges of the respective discs. The peripheral portions of the ribs from the blanks from between the ribs in the inverted position after the discs have rotated a half revolution. Both the positioning and removing means are provided with means for retaining the blanks thereon as they are respectively fed into the discs and removed from the discs.

Other objects, advantages and features of the present invention will be apparent from the accompanying description and drawings, which are merely exemplary.

In the drawings:
FIG. 1 is a side elevational view of the turnover device according to the present invention and positioned between the printing and scoring sections of the apparatus;
FIG. 2 is a side elevational view of the turnover device of FIG. 1 but with the cover plate removed to illustrate the conveyor belts for positioning and removing blanks;
FIG. 3 is a sectional view taken along the line 3-3 of FIG. 1;
FIG. 4 is a sectional view taken along the line 4-4 of FIG. 1; and
FIG. 5 is an elevational view taken in the direction of the line 5-5 of FIG. 4.
FIG. 6 is a broken view partially in section showing one form of adjusting means.

Proceeding next to the drawings wherein like reference symbols indicate the same parts throughout the various views, a specific embodiment of the present invention will be described in detail.
can now be die-cut to their final shape or scored to facilitate folding into containers.

An electrical control circuit, which is now in the art, is provided to control the speed of rotation of the turnover device with respect to the rate of movement of the conveyor belts so that the transfer of the blanks from the printing section to the scoring section is closely coordinated.

The suction boxes 45 can be carried on guides 60 (FIG. 6) so as to adjust the distance between discs 13, 14. As one example, threaded rod 61 cooperates with nuts 62 (one in each box) so that when nuts 62 are rotated by a suitable sprocket and motor, boxes 45 will move in and out relative to each other on guide 60. The discs are suitable slidably connected to shaft 15.

FIG. 5 shows a means for simplifying adjustment of the register of discs 13, 14 with the apparatus.

If desired, radially extending rods or members 63 can be mounted on shaft 15, the rods matching the spacing of ribs 16. The radially extending rods will assist in supporting a box blank while it is being turned.

Thus, it can be seen that in the present invention printed blanks are delivered into sector-shaped compartments as defined by opposing ribs and inverted by the upward rotation of these ribs through a half revolution. The inverted blanks are placed upon conveyor belts which remove the inverted blanks in a horizontal direction toward the scoring device.

It will be understood that various details of construction and arrangement of parts may be made without departing from the spirit of the invention.

What I claim is:

1. An apparatus for the printing and scoring of blanks of sheet material for folding its boxes, a turnover device comprising a horizontal rotatable shaft, a pair of coaxial discs axially spaced on said shaft, a plurality of equally spaced radially extending ribs on the inner face of each of said discs, the ribs on one disc being aligned with the ribs on the other disc; the blanks being positioned horizontally between ribs on said discs and removed horizontally in inverted position after half revolution of the discs.
2. An apparatus claimed in claim 1 with the outer ends of the ribs terminating short of the peripheries of the respective discs.
3. An apparatus as claimed in claim 2 with the peripheral portions of the discs outwardly of the outer ends of said ribs are flared outwardly.
4. An apparatus as claimed in claim 1 and means between said discs on one side of said shaft for positioning blanks horizontally between ribs on said discs, and means between said discs on the other side of said shaft for removing the blanks from between the ribs in inverted position after the discs have rotated a half revolution.
5. An apparatus as claimed in claim 4 and means drivingly connected to said shaft for rotating said shaft and discs in a direction upwardly from the blank positioning means.
6. An apparatus as claimed in claim 4 wherein said positioning and removing means each comprises endless conveyor belt means.
7. An apparatus as claimed in claim 6 with each endless conveyor belt means comprising a pair of parallel endless conveyor belts.
8. An apparatus as claimed in claim 7 and comprising means on said conveyor belts for retaining the blanks thereon.
9. An apparatus as claimed in claim 7 and comprising means acting upon the upper reaches of both pairs of conveyor belts for creating a suction therethrough to retain the blanks thereon.
10. An apparatus as claimed in claim 7 with said belts being perforated, a suction box having its upper face open and closing each of said conveyor belts, the upper reach of each belt being positioned in the open face of its respective suction box, and means for establishing a suction within said suction boxes whereby a suction is created through said perforated belts to retain blanks on the upper reaches thereof.
11. An apparatus as claimed in claim 7 with said pairs of belts being positioned immediately inwardly of said ribs on the discs.
12. An apparatus as claimed in claim 1 wherein the discs are adjustably mounted on said shaft so as to be movable relative to each other to accommodate various width sheets.