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(71) Applicant: **MELZER MASCHINENBAU GmbH**
D-58332 Schwelm (DE)

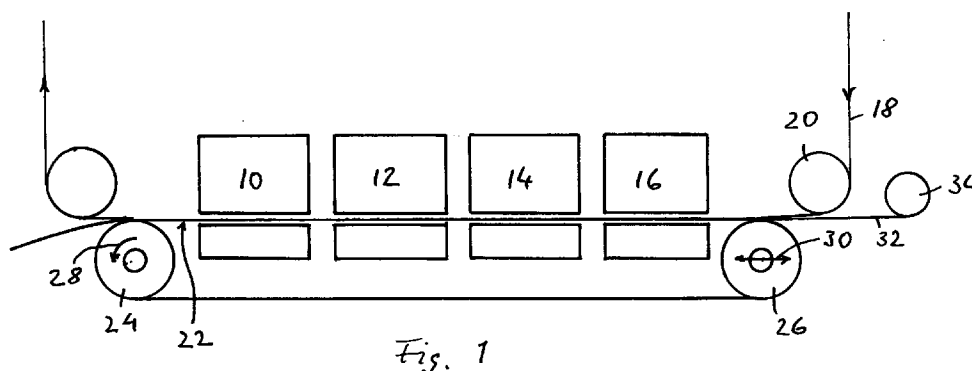
(72) Inventors:
• **Melzer, Rainer**
D-58332 Schwelm (DE)
• **Melzer, Roland**
D-58332 Schwelm (DE)

(74) Representative: **Sparing - Röhl - Henseler**
Patentanwälte
Rethelstrasse 123
40237 Düsseldorf (DE)

(54) An apparatus for transporting a web through stations of a working plant

(57) A web of plastic or cardboard material is to be transported through a number of working stations such that cards to be produced from said web are properly aligned in each of the stations. For this purpose, the web is releasably coupled with a carrier tape which is stepwisely moved across the stations, the alignment

accuracy being defined by series of equidistant perforations cooperating with sprocket drums. The rotation angle of the drums is predetermined by the number of pulses supplied to stepping motors driving the drums.



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Description

The present invention relates to an apparatus for transporting a web through a plurality of stations of a working plant. The web may be a plastic web of solid or laminated material.

In the fabrication of plastic cards, as credit cards, cheque cards, telephone cards and the like, the material web is transported through a plurality of working stations, for example printing stations, milling stations for milling a recess into which a chip is to be embedded, punching stations and the like. In the prior art, the web has a width exceeding that used for the cards, and the excess margins are provided series of holes, the series extending parallel to the transportation direction, and the holes being spaced from one another by accurately repeated distances. In each of the working stations, pins engage into the holes so as to hold the web portion between the pins in a tensioned state. The web is stepwisely transported from station to station by means of clamps which do not engage the holes but hold the web in a pinching operation.

Such systems of the prior art have a number of drawbacks.

The material consumption is higher than necessary because of the margins to be provided for the series of holes thereby increasing the costs of manufacture, in particular if expensive materials as e.g. poly carbonate are used.

While the regular hole spacing results in very accurate alignment but only for one given size of card. For each different size, another punching tool must be provided. When the plant is set up, the number of rejects is relatively high as the web may be transported in one direction only. This again increases the manufacturing costs.

The tensioning systems provided at each station for the web render the plant complex, susceptible to trouble, and the distance between stations must be larger than necessary for the very working.

Finally, the various tensioning operations abrade fines from the web material so that suction cleaning is permanently required because such cards must be produced under clean environmental conditions.

It is an object of the present invention to provide an apparatus for transporting a solid or laminated web through a plurality of stations in a working plant permitting transportation without wear, through steps of selectable size, and in both directions whereby the working stations may be simplified and disposed closer to one another.

According to the present invention, an apparatus for transporting a web through a plurality of stations of a working plant comprises a carrier tape which extends across the stations and is formed into an endless closed loop. The carrier tape is perforated such that equidistant holes are arranged in series in the longitudinal direction of the tape. Means are provided to displace the tape in steps, said means cooperating with the holes; the displacement stroke need not necessarily coincide with the distance by which adjacent holes are spaced. Means are provided to hold the web on the tape as long as the web passes through the working stations.

It will be understood that the width of the web from which cards are to be produced need not exceed that necessary for the cards themselves as the lateral perforated margin is provided on the tape. Further, the tape may be tensioned over all stations by one single tensioning means so that the stations need not have such means.

The tape may be made of a material which resists the working environment. Steel is preferred but plastic, e.g. polyester, may be suited as well. Perforation of a steel tape may be performed with extreme precision before the tape is closed to form the loop by, e.g. plasma welding.

The displacement means preferably comprises drums having circumferentially disposed sprockets in engagement with the carrier tape holes. The carrier tape preferably is looped around a first driving drum and a second driven drum, and the distance spacing the drum axes defines the tension of the tape. In a preferred embodiment, the axis of the driving drum is stationary while the axis of the driven drum is displaceable so that the distance between the axes may be varied in order to adjust the tape tension. Such tension adjustment may be advisable in response to temperature variations. However, various other reasons may cause variation of the tape tension so that it is preferred to control the tension in response to the measured distance between adjacent holes.

Preferably, stepping motors drive the sprocket drum in order to displace the carrier tape by a predetermined stroke. The engagement between the sprockets and the holes provides for an unambiguous relation between the number of pulses supplied to the stepping motor and the stroke through which the carrier tape is displaced.

The means for holding the substrate web or laminated web on the tape may be provided on the tape itself. A relatively simple means is a bonding coating on the tape. Care must be taken to select a bonding material from which the web may be released without traces of bonding material being left on the web. It may be advisable to provide a cleaning apparatus downstream of the last working station to remove used bonding material and a coating apparatus downstream of the cleaning apparatus to freshly coat the tape upstream of the first station, thereby avoiding deterioration of the coating over time.

Instead, or in addition, the tape may carry elements which laterally engage the web.

A further option is a vacuum source connected to a suction plenum placed beneath the tape which, in this case, must be air-permeable so as to permit aspiration of the web onto the tape.

Of course, a plurality of holding means may be combined.

A further holding or retaining means will be dis-

closed in connection with the description of a preferred embodiment.

It is to be understood that the "web" may consist of a series of cards already stamped from a substrate or laminate. The invention is applicable to webs of plastic as well as webs made of cardboard.

The attached drawings illustrate the present invention.

- Fig. 1 is a schematic sideview of a card making plant, 10
 Fig. 2 is a partial section view of drum 26 in Fig. 1, and
 Fig. 3 is a partial section view of a modified holding means. 15

In Fig. 1, the working stations 10, 12, 14, 16 are only schematically indicated. They may be four printing stations, one for each of the colors red, blue, yellow and one for black. The substrate web 18 to be printed on passes over a guiding drum 20 towards carrier tape 22 which surrounds a driving drum 24 and a driven drum 26. The drums rotate in accordance with arrow 28, driven by a stepping motor (not shown). Driven drum 26 is displaceable in direction of arrow 30 in response to ambient temperature variations. 20 25

A strip 32 of plastic is coated on both of its faces with an adhesive or bonding material. The strip is wound on bobbin 34 and fed between web 18 and carrier tape 22. Downstream of station 10, the strip is released from both carrier tape 22 and web 18 and is discarded. Instead of the single broad strip 32 a plurality of narrow ribbons may be used. 30

Fig. 2 is a partial section view of the driven drum 26 having sprockets 36 in engagement with holes 38 of tape 22. In addition to strip 32, the web 18 is held on carrier tape 22 by small upstanding stampings 39 cut from tape 22 and angled upwards. 35

Fig. 3 illustrates schematically another embodiment of the holding means. A plenum chamber 40 is connected to a vacuum pump 42 and disposed beneath tape 22 which, in turn, is provided with small apertures 44 through which the negative pressure, produced by pump 42, acts on web 18. Such suction units are preferably provided upstream and downstream of the stations 10 through 16. 40 45

Claims

1. An apparatus for transporting a web through a plurality of stations of a working plant, comprising: 50
 - a carrier tape extending across said stations and forming a closed loop,
 - at least one series of holes spaced by regular distances in longitudinal direction of said tape, 55
 - means for stepwisely displacing said carrier tape by cooperation with said holes,

- means for holding said web on one face of said tape.

2. The apparatus of claim 1 wherein said tape is made of a material selected from the group comprising steel and plastic.
3. The apparatus of claim 1 wherein said means for displacing comprise drums, at least one of said drums having circumferentially disposed sprockets in engagement with said tape holes.
4. The apparatus of claim 3 wherein said carrier tape is held under tension between two drums.
5. The apparatus of claim 4 wherein said tension is adjustable.
6. The apparatus of claim 5 wherein said tension is adjustable in response to temperature variations.
7. The apparatus of claim 1 wherein said means for holding are disposed on said carrier tape.
8. The apparatus of claim 7 wherein said carrier tape has an adhesive coating.
9. The apparatus of claim 7 wherein said carrier tape is provided with elements positively engaging said web.
10. The apparatus of claim 1 wherein said means for holding include a vacuum source by means of which said web is sucked onto said carrier tape.
11. The apparatus of claim 1 wherein said means for holding include a strip having two main faces, each face being provided with an adhesive bonding agent, and means to feed said strip between said carrier tape and said web upstream of said stations, said bonding agent being selected to be released from said carrier tape and said web downstream of said stations.
12. The apparatus of claim 1 wherein a plurality of different means for holding are provided.

