July 27, 1965 D. E. CRAIG 3,197,201

CARD TRANSPORT SYSTEM

Filed Nov. 7, 1960 2 Sheets-Sheet 1

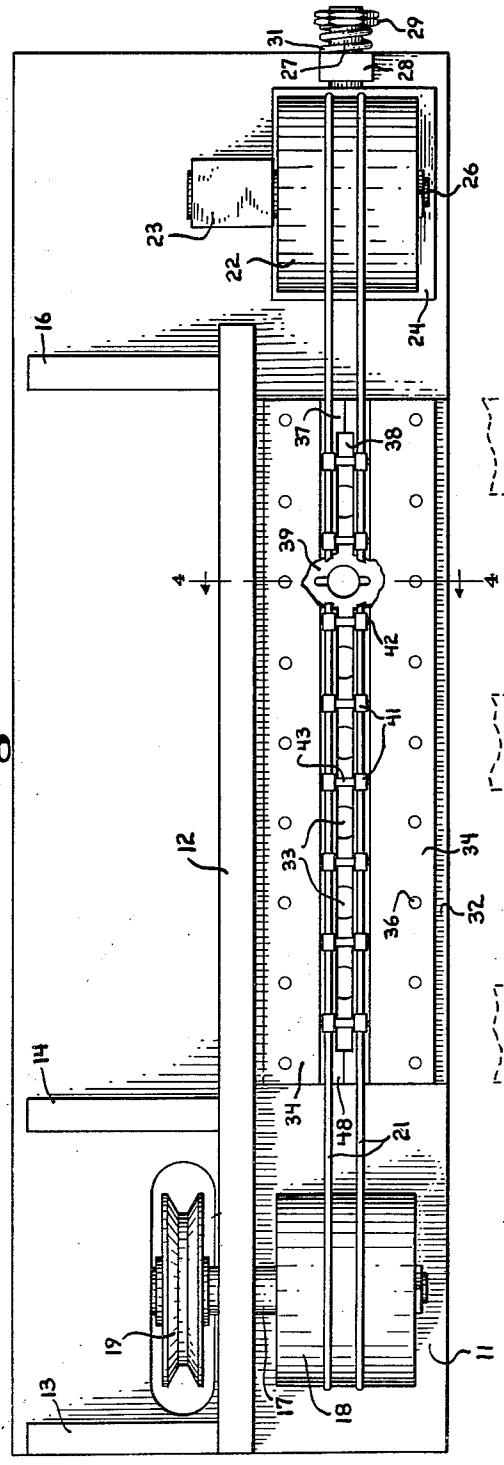


Fig. 1.

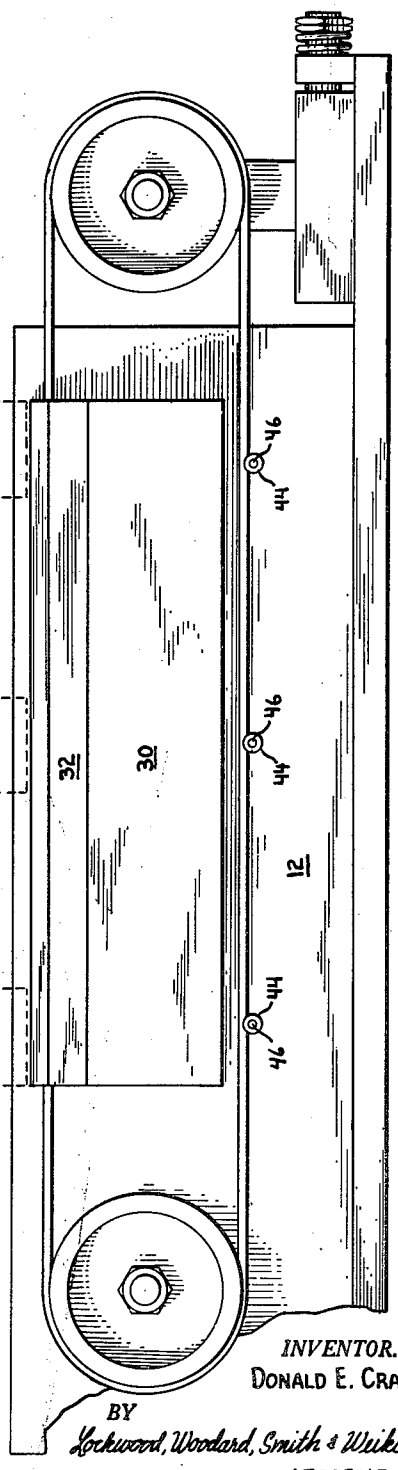


Fig. 2.

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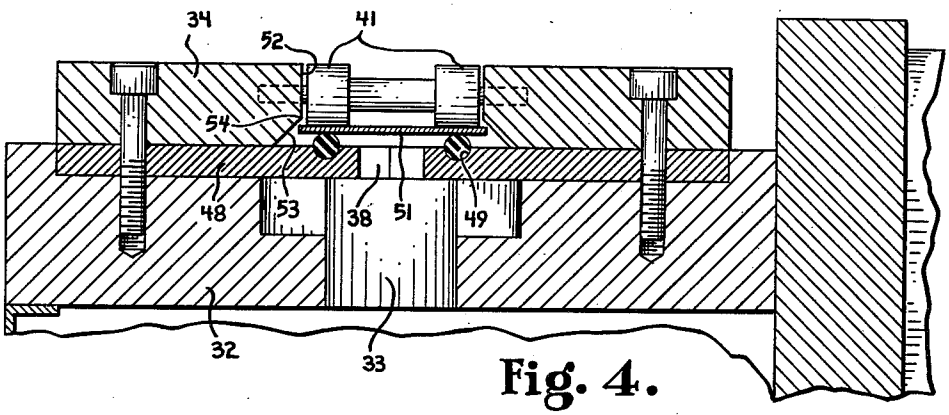


Fig. 4.

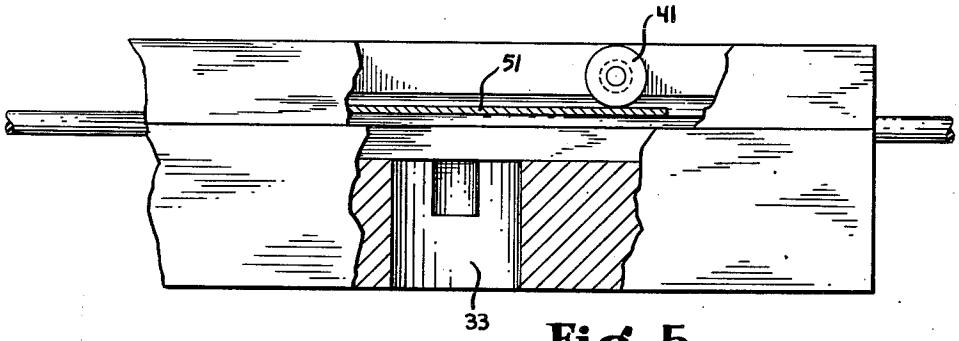


Fig. 5.

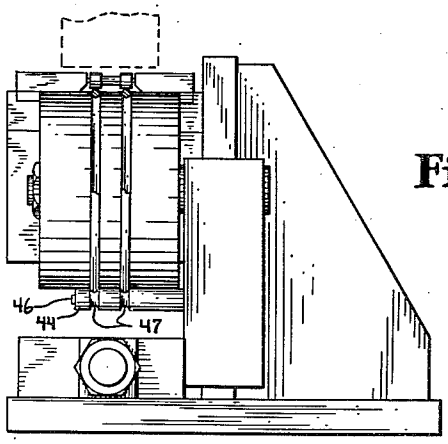


Fig. 3.

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3,197,201

CARD TRANSPORT SYSTEM

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8 Claims. (Cl. 271—74)

The invention is related generally to conveyors, and more particularly to conveyors for small sized photographic film segments hereinafter called cards.

It is well known that filing systems can be established using very small film records of documents whereby it is made unnecessary to keep files of the full sized original paper documents. Various systems of storing documentary information on microfilm have been devised. Some of these, while providing the advantage of minimizing the space required for files, do require elaborate equipment and coding systems. It has been observed that in an effort to simplify the equipment required, some means of rapidly transporting small film segments or cards is needed.

It is, therefore, an object of this invention to provide means for rapidly transporting film segments at a preselected rate.

It is another object of this invention to provide means for rapid transport of film cards with a minimum of mechanical and human contact with card surfaces.

It is still another object of this invention to provide a rapid transport system for cards in which the movement of the cards in all directions, except the desired transporting direction, is restrained within narrow limits.

The present invention in a typical embodiment thereof provides an endless belt conveyor of two strands which are driven between sheaves and guided by means of grooves provided in a pair of tracks. Provision is made for application of a vacuum beneath the strands so that film segments fed to the moving belt are maintained firmly in place thereon by a pressure differential across the film segment.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

FIG. 1 shows a plan view of a typical embodiment of this invention.

FIG. 2 shows a front elevation of the embodiment of FIG. 1.

FIG. 3 shows a side elevation of the embodiment of FIG. 1.

FIG. 4 shows an enlarged fragmentary section taken along the line 4—4 of FIG. 1.

FIG. 5 shows an enlarged fragmentary front elevation with a portion broken away to illustrate the construction whereby the area immediately below the conveyor belts is communicated with a vacuum manifold.

Referring to the embodiment of FIG. 1, there is shown a base plate 11 having an upright portion 12 which is braced by means of the buttresses 13, 14 and 16. The upright 12 provides a journal for a shaft 17 supporting a sheave 18. A sheave 19, which is also fastened to the shaft 17, merely represents one means for driving the sheave 18. A pair of endless belts 21 pass over the sheave 18, and the idler sheave 22 which is supported by the upright member 23 is in turn fastened to a block 24.

A shaft 26 may be journaled in the upright 23 or may be fixed therein with the sheave 22 being journaled on the shaft 26. The block 24 is adjustable to provide the proper tension on the belt by means of an adjusting screw 27 which passes through a boss 28 fastened

to the base plate 11. The particular adjustment is made possible by a spring 31 and a pair of jam nuts 29.

A bed portion 32, which is fastened to the upright member 12, has a series of perforations or ports 33 therethrough which provide for communication of the region about the belts passing over the bed portion with a vacuum manifold fastened to the underside thereof. A pair of card guides 34 is fastened to the bed portion by means of the screws 36. Between the card guides and the bed portion are belt tracks 48 which are shown more clearly in FIG. 4. The tracks 48 have a space 38 between them providing for communication of a vacuum beneath the bed portion to the region about the belts. The broken away portion of the card guides 34 and the tracks 48, and which is designated by reference numeral 39, illustrates the construction of the bed portion at the locations of the perforations 33. A series of rollers 41 is provided above the belts 21. The rollers are mounted on shafts 42 which are supported on card guides 34, the rollers on each side being separated by the spacers 43.

FIG. 2, showing the front elevation, illustrates a series of support idler rollers 44 mounted on the shafts 46 which are in turn supported by the upright portion 12. The vacuum manifold 30 is fastened to the bed portion 32. The blocks indicated by the dotted outlines represent apparatus, such as a card feed station, a card reading station and a card removal station, not a part of this invention, but which may be used in connection with it.

FIG. 3 illustrates a round cross section of the belts used in a typical embodiment of this invention. It also illustrates corresponding semi-circular grooves 47 in the outside diameter of the support idler rollers 44.

FIG. 4, which is an enlarged cross section taken along the line 4—4 of FIG. 1, shows more clearly the construction of the belt tracks 48 and the semi-circular grooves 49 therein which support the belts 21 so that they are approximately half enveloped by the grooves 49 and half exposed to support the card 51. The card guides 34 have vertical sides 52 which are intersected by a chamfered edge 53 at the line 54.

The preferred construction has the vertical walls 52 separated from each other such a distance that they extend slightly over the edges of the card 51 and the chamfered edge of the card guides provides the necessary clearance to permit passage of the cards and yet provides a lateral margin to define a path for the cards as they are carried by the belts 21. The rollers 41 are normally located above the belts 21 and in very close proximity thereto so that they can assist the vacuum provided by means of the port 33 to hold the card 51 firmly to the belts 21.

FIG. 5 illustrates the relationship of the port 33, the card 51 and the retaining rollers 41 in the front elevation.

The construction of the typical embodiment permits extremely rapid transport of cards, 2500 feet per second being not unusual. The location of the grooves in the tracks 48, the lateral separation of the tracks providing the space 38, and the vacuum applied, while firmly retaining the cards on the belts does not permit the cards to contact any surface toward their center whereby they could become scratched or otherwise damaged. The number and spacing of perforations in the bed plate may be varied according to the nature of the card to be transported. The small rollers inhibit belt vibration.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered to be illustrative and not restrictive in character, as modifications may readily suggest themselves to persons skilled in this art and within the

broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A card transport system comprising: parallel movable belt strands driven between a pair of sheaves, said strands having cross sections with a small ratio of maximum to minimum dimension and said sheaves having grooves in their outside diameter; a driving means coupled to said sheaves; tracks disposed between said sheaves and having grooves therein to maintain the parallel relation of said strands in a plane on one side of the axes of said sheaves and said tracks being formed to provide an opening between said strands; idler rollers located in confining relation to said strands on another side of the axes of said sheaves; card guides disposed laterally from the track grooves for defining the path of cards conveyed by said strands; a series of retaining rollers having axes perpendicular to the direction of grooves in said tracks and spaced along said card guides, said rollers having their peripheries disposed in close proximity to said strands on a side of said strands opposite the grooves in said tracks; and a bed portion supporting said tracks and having a port therein coupled to said opening providing for communication of the region about said tracks between said strands with a source of vacuum to secure cards to said strands.

2. A card transport system comprising: parallel movable belt strands driven between a pair of sheaves, said strands having cross sections with a small ratio of maximum to minimum dimension and said sheaves having grooves in their outside diameter; a driving means coupled to said sheaves; tracks disposed between said sheaves and having faces with grooves therein to maintain the parallel relation of said strands in a plane on one side of the axes of said sheaves, and said tracks being formed to provide openings in the faces thereof between said strands; idler rollers located in confining relation to said strands on the other side of the axes of said sheaves; card guides disposed laterally from said track grooves and providing margins parallel to said track grooves for defining the path of cards conveyed by said strands; a series of retaining rollers mounted on shafts having axes perpendicular to the direction of grooves in said tracks and spaced along said card guides, said rollers having their peripheries disposed in close proximity to said strands on a side of said strands opposite the grooves in said tracks; and a bed portion supporting said tracks and having a port therein coupled to said openings providing for communication of the region about said tracks between said strands with a source of vacuum to secure cards to said strands.

3. A card transport system comprising: parallel movable belt strands driven between a pair of sheaves, said strands having cross sections with a small ratio of maximum to minimum dimension and said sheaves having grooves in their outside diameter; a driving means coupled to said sheaves; tracks disposed between said sheaves and having faces with grooves therein to maintain the parallel relation of said strands in a plane on one side of the axes of said sheaves and said tracks being formed to provide openings in the faces thereof between said strands; idler rollers having grooves in their outside diameters and located in confining relation to said strands on the other side of the axes of said sheaves; card guides disposed laterally from said track grooves for defining the path of cards conveyed by said belts; a series of retaining rollers mounted on shafts having axes perpendicular to the direction of grooves in said tracks and spaced along said card guides, said rollers having their peripheries disposed in close proximity to said strands opposite the grooves in said tracks; and a bed portion supporting said tracks and having perforations therein coupled to said openings providing for communication of the region about said tracks between said strands with a source of vacuum to secure cards to said strands.

4. A card transport system comprising: a pair of parallel movable endless belts driven between a pair of sheaves, said belts having a round cross section and said sheaves having grooves of semi-circular cross section in their outside diameter such that the belts extend beyond the outside diameter of the sheaves; a driving means coupled to one of said sheaves; a track for each of said belts and disposed between said sheaves and having a face with a groove of semi-circular cross section therein to maintain the parallel relation of said belts in a plane on one side of the axes of said sheaves, said tracks being laterally separated to provide a space therebetween; idler rollers having grooves of semi-circular cross section in their outside diameters and located in confining relation to said belts on an opposite side of the axes of said sheaves; card guides disposed laterally from said track grooves for laterally defining the path of cards conveyed by said belts; a series of retaining rollers mounted on shafts having axes perpendicular to the direction of grooves in said tracks and spaced along said card guides, said rollers having an outside surface disposed in close proximity to said belts on a side of said belts opposite the grooves in said tracks; means for adjusting the belt tension; a bed portion supporting said tracks and having perforations therein coupled to a source of vacuum and communicating through said space between the tracks to a region between said belts adjacent the face of said tracks, to secure cards to said belts for transportation of the cards.

5. In combination for obtaining a controlled transport of cards having a particular width,

a pair of belt tracks, there being a groove in each of the belt tracks,

a pair of belts each supported in a different one of the grooves in an endless configuration and each having a portion extending above the grooves,

the belts being spaced by a distance less than the particular width of the cards to provide a support of the cards by the belts,

a pair of card guides disposed in spaced relationship to each other by a distance corresponding substantially to the width of the cards, the card guides extending to the belt tracks and being chamfered at a position adjacent to the belt tracks to provide progressively increasing distances between the card guides with progressive positions toward the belt tracks,

the belts being disposed laterally relative to the chamfered positions of the card guides,

means operatively coupled to the belts for driving the belt tracks in the endless configuration, and

means operatively coupled to the belts for movement at spaced positions along the belt tracks for producing a vacuum force to retain the cards on the belts.

6. The combination set forth in claim 5 wherein rollers are disposed on the opposite side of the cards from the belts for pressing the cards against the belts during the movement of the belts in the endless configuration.

7. In combination for obtaining a controlled transport of cards having a particular width,

a bed portion, there being a series of ports at spaced positions in the bed portion,

a pair of tracks supported on the bed portion, there being a series of ports in the tracks at positions corresponding to the ports in the bed portion,

a pair of card guides supported on the bed portion, the card guides being separated from each other by a distance corresponding substantially to the particular width of the card and being disposed relative to the tracks to have the separation correspond in position to the ports in the bed portion and the tracks,

the card guides being chamfered at positions near the tracks to provide for a progressively increasing separation between the card guides at progressive positions toward the tracks,

there being a pair of grooves in the tracks at a pair of positions between the card guides,

a pair of belts each disposed in a different one of the grooves in the tracks and each extending above its associated groove to be partially disposed in the space between the pair of card guides,

the belts being disposed in an endless configuration,

means operatively coupled to the belts for driving the belts for movement in the endless configuraiton, and

means operatively coupled to the ports in the bed portion for producing a vacuum force in the ports to obtain a fixed disposition of the cards on the tracks during the movement of the cards along the tracks.

8. The combination set forth in claim 7 wherein a plurality of rollers are disposed on the opposite side of the cards from the belts and are disposed against the cards at spaced positions along the tracks to press the cards on the belts during the movement of the cards with the belts.

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