PATENT SPECIFICATION (11) 1 565 709

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(21) Application No. 1372/77 (22) Filed 13 Jan. 1977 (19)

(31) Convention Application No. 648838 (32) Filed 14 Jan. 1976 in

(33) United States of America (US)

(44) Complete Specification Published 23 Apr. 1980

(51) INT. CL.[3] G03B 27/00

(52) Index at Acceptance
G2A 335 336 C3 C4 C6 MF
B8A GA P6 R1
G2J 41L2A

(54) TRANSPORT APPARATUS FOR INFORMATION CARRIERS SUCH AS MICROFICHE

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to apparatus for transporting information carriers such as microfiche to and from an operating station at which a viewing, printing or other operation may be effected.

In accordance with the present invention there is provided apparatus for transporting information carriers; the apparatus comprising successive and adjacent loading, operating and lifting stations followed by an exit station; feeding means for stepwise transporting carriers in succession from a stack at the loading station to the operating station (at which a viewing, printing or other operation may be effected on a single stationary carrier) and for simultaneously transporting the said information carriers from the operating station to the lifting station, which lifting station comprises an elevator; and transfer means by which the carriers may be transferred in succession from the elevator and directed to the exit station or recycled to the loading station.

The information carriers may be disposed in respective frames, and the feeding means may engage the frame of an information carrier in the loading station and eject this first frame into the operating station, the frame of a second information carrier being engaged by the said first frame and ejected thereby into the lifting station.

The transfer means may comprise a transfer member selectively movable between spaced belts, which carry an information carrier frame, to deflect the frame from the elevator. A second transfer member, stationary in operation, may be positioned above the level of the first-mentioned transfer member.

In the detailed description of a preferred embodiment of the invention presented below by way of example, reference is made to the accompanying drawings in which:

Fig. 1 is a perspective view of a microfiche carrier frame suitable for transport by a transport apparatus in accordance with the present invention;

Fig. 2 is a perspective view of the transport apparatus of this invention; and

Fig. 3 is segmental side elevational view partially in section of the elevator of the transport apparatus.

An automatic apparatus is described which is capable of transporting frame-mounted microfiche. Referring now to Fig. 1, a microfiche frame 10 is shown which comprises a generally rectangular plastics frame element 12 having a plurality of microfiche strips (several of which are indicated by the numeral 14) attached at each end to the frame element 12. The apparatus described transports frame elements 12. Therefore, it will be apparent that an empty frame element 12, a frame element 12 having a single piece of microfiche attached thereto, or a frame element 12 having any other sheet-like information carrier attached thereto, may be transported by the apparatus described herein equally as well as the one example shown in Fig. 1.

Fig. 2 shows a transport apparatus which is a presently preferred embodiment of the invention. The transport apparatus, generally denoted 20, comprises a loading bin 22 for storing a plurality of frames 10 in a vertical stack. The height to which frames 10 may be stacked, and thus the capacity of loading bin 22, is limited by the height of bin 22. Frames 10 are fed individually from loading bin 22 along a pair of support rails, one of

which is identified by numeral 23 to an operating station constituted by exposure station 24 by a reciprocally movable pusher element 26. Pusher element 26 is actuated by a known motor and scotch yoke mechanism 27. The pusher element 26 is generally the same height as a single frame 10, and slides transversely towards operating station 24 causing the leading end thereof to engage and push a frame 10 from the bottom of the stack of frames in the loading bin 22 along support rails 23 to exposure station 24, the remaining frames 10 being supported by pusher element 26. When the pusher element 26 is retracted to the position shown in Fig. 2, the stack of frames 10 drops down a distance equal to the height of the removed frame 10.

With the frame 10 in the exposure station 24, a preselected number of exposures are made, by briefly energizing a xenon flash tube 30, on a film strip (not shown) intermittently advanced to the exposure station. Alternatively, the operating station could be used as a viewing station or for performing any other operation with the frame 10. After all operations performed in operating station 24 concerning frame 10 are completed, the pusher element 26 strips another frame 10 from the vertical stack in loading bin 22 and slides the frame into operating station 24, thereby pushing the previously copied frame from operating station 24 to a lifting position 11. A portion of a ramp member 32 ensures that the inertial motion of the copied master frame 10 does not cause the frame to slide past the position indicated. In a similar manner, the frame 10 at the lifting position acts as a stop to prevent the succeeding frame from sliding further into operating station 24 than is desired.

A frame 10 in the lifting position 11 is lifted by an elevator assembly. In the embodiment shown in Fig. 2, the elevator assembly comprises a pair of vertically extending endless belt members 34 and 36 having a plurality of laterally protruding ribs 37. Each of the belt members 34 and 36 is supported at one end by a guide roller 38 and 40 respectively, and at the opposite end by a drive roller 42 and 44 respectively. The drive rollers 42 and 44 are driven by a motor 46 and are mounted to an upper roller support plate 48. The guide rollers 38 and 40 are similarly mounted to a lower roller support plate 50. As belt members 34 and 36 are advanced, a pair of complementary aligned protruding ribs 37 engage the end portion of frame 10 and lift the frame either to a recycle slide member 52 or to an exit slide member 54 as illustrated in Figs. 2 and 3. As frame 10 is being lifted by ribs 37, inclined ramp member 32 causes frame 10 to slide horizontally along ribs 37 which support the master frame thereby controlling the horizontal position of the frame on the elevator. If it is desired to transfer frame 10 from the elevator assembly to recycle slide member 52 (which returns a frame 10 thereon, shown in phantom, to the loading bin 22) an air piston 58 is activated which positions a recycle ramp 60 as shown. A frame 10, shown in phantom, which has been partly ejected from ribs 37 by ramp member 32 is completely ejected from ribs 37 by recycle ramp 60 on to the recycle slide member 52. Similarly, an exit ramp 64, which can remain stationary in operation, is positioned above the level of ramp 60 to transfer a frame from the elevator assembly to the exit slide member 54.

Frames 10 transferred to exit slide member 54 are delivered to an exit hopper 68. Depending upon the speed at which the transport apparatus 20 operates, it may be desirable to equip each of the slide members 52 and 54 with a plurality of openings through which air is forced to provide an air bearing over which the frames may slide easily.

To assure that the last frame printed is transported from the exposure station to the elevator, a dummy frame is provided which is placed on the bottom of the first input group of frames. The dummy frame is similar to a standard frame but has no aperture for holding fiche. The dummy frame is loaded into the apparatus first, and the pusher element 26 transports this frame first. During subsequent normal operation making copies from successive frames in this input group, the dummy frame is recycled to the loading bin and the remaining frames pass to the exit hopper. The dummy frame is then re-fed to the exposing station at the end of this input group. When the first frame of a second input group of frames is fed into the exposing station, the dummy frame is moved thereby to the lifting position and serves to position this first frame at the exposing station.

The belt members 34 and 36 may be advanced continuously or in discrete steps. If belt members 34 and 36 are advanced in steps from a normal stop position in which the space between succeeding ribs 37 is in alignment with the frame support surfaces of rails 23, it may be convenient to cause belts 34 and 36 to be advanced the distance between adjacent ribs 37 each time pusher element 26 operates. In this way, frame 11 will always enter a space between succeeding ribs 37, and upon operation of the belts 34 and 36 a pair of ribs 37 will engage the next frame. If the belts are to be advanced continuously, as would probably occur during high speed operation, some means should preferably be provided for coordinating the position of ribs 37 with the operation of pusher element 26 to prevent ribs 37 from being in a position which interferes with a frame advanced by pusher element 26. One such means is to

employ a photodetector (not shown) or similar device to check the position of ribs 37 just before pusher element 26 operates. If ribs 37 are momentarily in an interfering position, the operation of pusher element 26 can be slightly delayed by any suitable time delay means.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected. For example, although only an exit slide member and a recycle slide member are shown, other slide members may be provide, for example, to store the frames.

WHAT WE CLAIM IS:

1. Apparatus for transporting information carriers; the apparatus comprising successive and adjacent loading, operating and lifting stations followed by an exit station; feeding means for stepwise transporting carriers in succession from a stack at the loading station to the operating station (at which a viewing, printing or other operation may be effected on a single stationary carrier) and for simultaneously transporting the said information carriers from the operating station to the lifting station, which lifting station comprises an elevator; and transfer means by which the carriers may be transferred in succession from the elevator and directed to the exit station or recycled to the loading station.

2. Apparatus as claimed in Claim 1, wherein the information carriers are disposed in respective frames and the feeding means is arranged to engage the frame of an information carrier in the loading station and eject this first frame into the operating station, the frame of the said second information carrier being engaged by the said first frame and ejected thereby into the lifting station.

3. Apparatus as claimed in Claim 2, wherein the elevator comprises a spaced pair of endless belts arranged to carry between them the frame of an information carrier.

4. Apparatus as claimed in Claim 3, wherein the belts have aligned ribs on which the said frame is carried.

5. Apparatus as claimed in Claim 3 or Claim 4, wherein the transfer means comprises a transfer member selectively movable between the belts to deflect the frame of an information carrier from the elevator.

6. Apparatus as claimed in Claim 5, wherein a second transfer member, stationary in operation, is positioned above the load of the first-mentioned transfer member.

7. Apparatus as claimed in Claim 5 or Claim 6, wherein the transfer member or members is or are arranged to deflect the frame of an information carrier onto a gravity slide leading to the exit station or onto a gravity slide leading to the loading station.

8. Apparatus as claimed in Claim 1 or Claim 2, wherein the feeding means comprises a reciprocally movable pusher.

9. Apparatus as claimed in any of the preceding claims, wherein pairs of rails provide support for an information carrier in the loading station, in the operating station, and during transport to the operating station.

10. Apparatus as claimed in Claim 4, including means for co-ordinating the feeding means with the ribs of the continuously moving elevator.

11. Apparatus as claimed in Claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

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Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1980.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

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2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

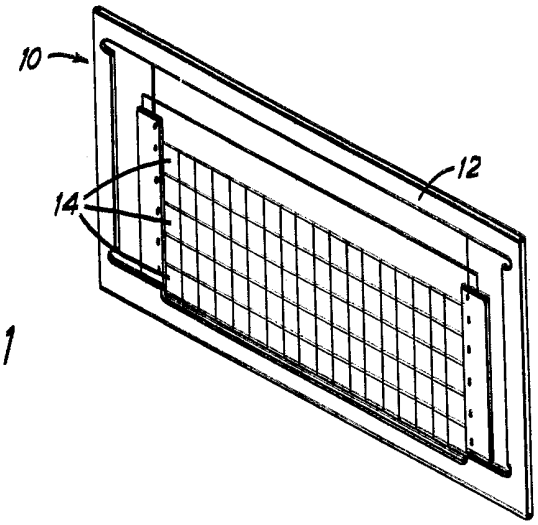


FIG.1

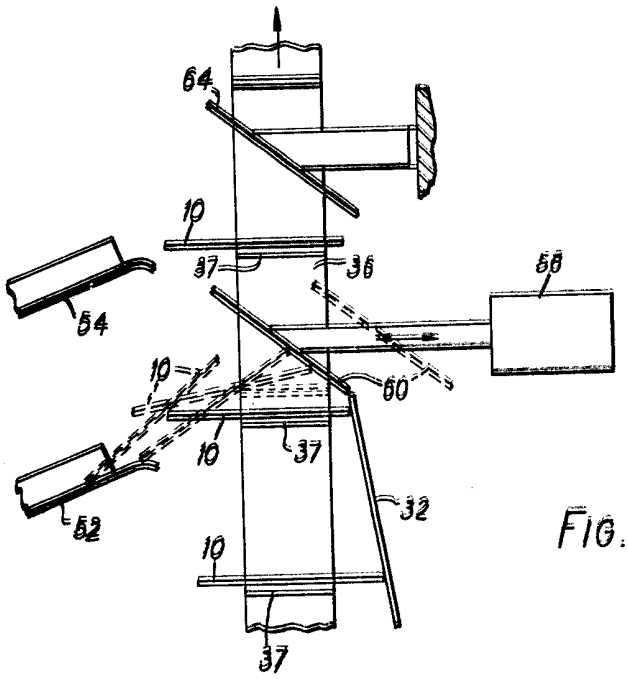
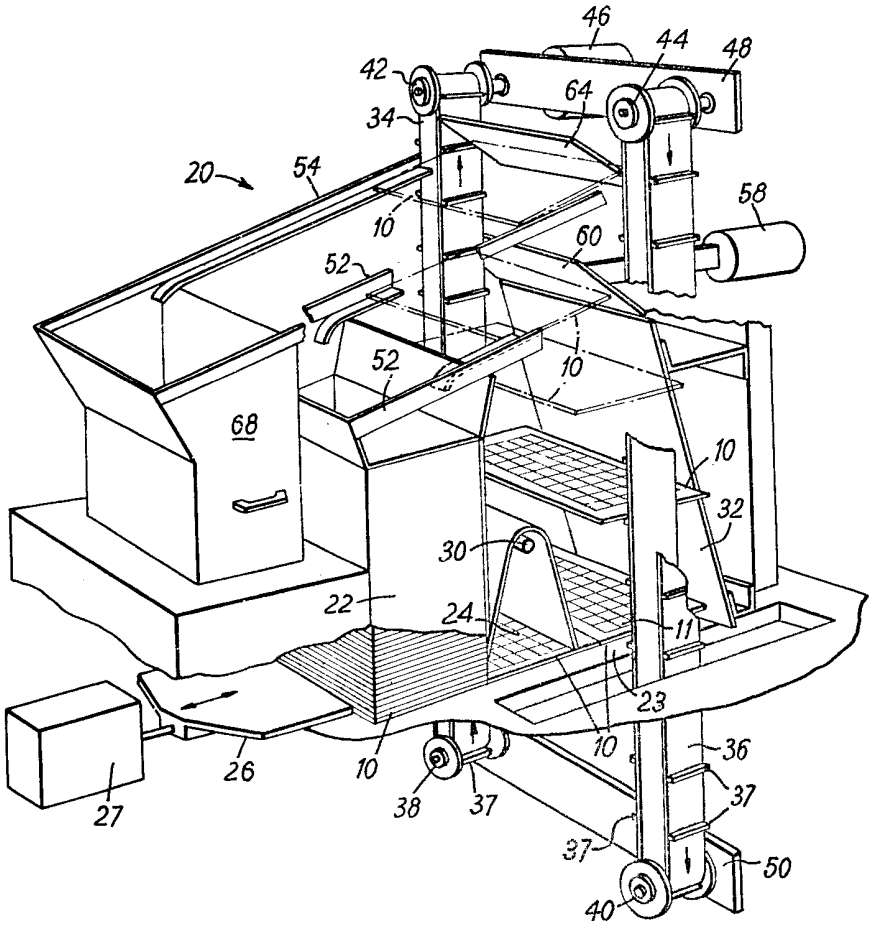


FIG.3

FIG.2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