TO: USI/Scientific & Technical Information Division
Attention: Miss Winnie M. Morgan

FROM: GP/Office of Assistant General Counsel for Patent Matters

SUBJECT: Announcement of NASA-Owned U. S. Patents in STAR

In accordance with the procedures agreed upon by Code GP and Code USI, the attached NASA-owned U. S. Patent is being forwarded for abstracting and announcement in NASA STAR.

The following information is provided:

U. S. Patent No. : 3,583,744

Government or Corporate Employee : Sperry Rand Corporation

Supplementary Corporate Source (if applicable) : Huntsville, AL

NASA Patent Case No. : MFS-20453

NOTE - If this patent covers an invention made by a corporate employee of a NASA Contractor, the following is applicable:

Yes [x] No [ ]

Pursuant to Section 305(a) of the National Aeronautics and Space Act, the name of the Administrator of NASA appears on the first page of the patent; however, the name of the actual inventor (author) appears at the heading of Column No. 1 of the Specification, following the words "... with respect to an invention of..."

Elizabeth A. Carter
Enclosure
Copy of Patent cited above

N71-29133

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https://ntrs.nasa.gov/search.jsp?R=19710019657 2019-12-20T22:02:12+00:00Z
ABSTRACT: A device for removing printed circuit cards from a container, such as a computer control box, comprising a tool having an end mechanism for engaging an adapter provided on the end of each printed circuit card. The tool firmly interlocks with the card adapter while simultaneously unlatching a spring loaded latch that secures the card in the container. Use of the tool permits removal, handling and replacement of printed circuit cards with the use of one hand.
DEVICE FOR HANDLING PRINTED CIRCUIT CARDS

ORIGIN OF THE INVENTION

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 304 of the National Aeronautics and Space Act of 1958, Public Law 83–568 (72 Stat. 435; 42 U.S.C. 2457).

BACKGROUND OF THE INVENTION

This invention relates generally to handling devices and more particularly to a device for removing printed circuit cards from a container, such as a computer control box, and replacing said cards in the container.

Modern electronic equipment often incorporates cabinet-like containers which hold numerous printed circuit cards arranged one above the other and which slide in and out of the container for purposes of inspection, repair and control operations. The frequent removal and replacement of printed circuit cards in the operation and maintenance of electronic equipment, such as computers, creates a need for a convenient and efficient means for handling of these cards. It is preferable that such a means eliminate any need for touching the cards with the hands to avoid contamination and possible damage to the circuitry printed on the surface of the cards. Moreover, for optimum convenience it is desirable that handling of the printed circuit cards require the use of only one hand. It is anticipated that in future space flights of long duration astronauts will be performing various tasks, during extravehicular activity, including the operation and inspection of electronic equipment. Therefore, a convenient and highly reliable device will be required for handling printed circuit cards by astronauts.

SUMMARY OF THE INVENTION

The invention comprises a device for removing printed circuit cards from a container, such as may be incorporated in a computer control unit, and replacing the cards in the container. The cards are typically slid in and out of the container, being guided and held by tracks that frictionally engage the opposite side edges of the cards. According to the invention, the front end of each printed circuit card is provided with an adapter secured to the end of the card. A handling tool for withdrawing the card from the container engages and interlocks with the adapter while simultaneously releasing a latch that secures the card in the container.

The tool comprises two rotatable interlocking elements in the form of cam blades that enter a slot in the card adapter and the rotation of the cam blades is accomplished by rotating a handle provided on the handling tool. To withdraw a printed circuit card from the container the card adapter is engaged by the handling tool and subsequently the handle of the tool is rotated whereby the two cam blades enter the slot in the adapter. This establishes a firm interlocking between the handling tool and the adapter. After the card is withdrawn it may be replaced in the container by simply pushing the card into its place with the handling tool and rotating the tool handle to its original position thus permitting the latch of the card adapter to move to the latched position and releasing the interlock between the cam lobes and the card adapter.

Accordingly, it is a general object of the present invention to provide a means for conveniently and reliably handling articles with the use of one hand.

A more specific object of the invention is to provide a device for removing printed circuit cards from a container and replacing the cards in the container.

Another object of the invention is to provide a tool for engaging a printed circuit card slideably disposed in a container and simultaneously unlatching a card latch so that the card may be withdrawn from the container and held and replaced in the container by the tool.

Another object of the invention is to provide a device for handling printed circuit cards including moving the cards in and out of a container without the need for touching the cards with the hand.

Another object of the invention is to provide a convenient and highly reliable means for handling of printed circuit cards by an astronaut during extravehicular activity of a space flight.

These and other objects of the invention will become apparent upon reference to the following specification, attendant claims and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of a container for printed circuit cards such as may be used in an electronic apparatus; FIG. 2 is an enlarged cross-sectional view taken along line 2–2 of FIG. 1 showing a printed circuit card positioned in the container; FIG. 3 is a cross-sectional view taken along line 3–3 of FIG. 2 showing an adapter installed on the end of the printed circuit card; FIG. 4 is a side view of the principal frame element of the card adapter shown in FIGS. 2 and 3; FIG. 5 is a side view of the latch element of the card adapter; FIG. 6 is a side elevation view of a handling tool for engaging the card adapter; FIG. 7 is a view of the lower end of the handling tool taken along line 7–7 of FIG. 6; FIG. 8 is a cross-sectional view of the handling tool taken along line 8–8 of FIG. 6; FIG. 9 is a perspective view showing the handling tool interlocked with the card adapter of a printed circuit card with the card partially withdrawn from its container.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, therein is shown a front elevational view of a container 11 that contains in drawerlike fashion a plurality of vertically aligned printed circuit cards 13. The container 11 may represent a component part of an electronic apparatus such as a control unit of a computer system. Corner frame members 15 of the container 11 have vertically spaced slots 17 therein that receive the opposite side edges of the respective printed circuit cards 13. Slanted guide surfaces 19 guide the printed circuit cards into the slots 17. As shown in FIG. 2, guide tracks 21 are attached to sidewalls 23 of the container 11 and frictionally engage the side edge portions of the printed circuit cards 13 so that the cards are slid in and out of the container 11, being guided and stabilized by the slots 17 and the guide tracks 21.

Referring particularly to FIGS. 2 and 3, each of the printed circuit cards 13 is equipped at its front end with a card adapter assembly 25 the purpose of which is to provide a means for latching the cards in the container 11 and to provide a portion that attaches to a card handling tool for unlatching the card and withdrawing it from the container and replacing it in the container. The card adapter 25 comprises an integral substantially cross-shaped member 27 extending along the end edge of the printed circuit cards 13, being joined to the cards through an attaching leg 29 fitted against the surface of the printed circuit card with rivets 31 extending through the card and the leg 29.

Also attached to the printed circuit cards 13 by rivets 31 are a pair of angle elements 33 that form with the cross-shaped member 27 a slot 35 that holds a sliding latch member 37. As shown in FIG. 5, the latch member 37 has a centrally located longitudinal slot 39 that merges into a slightly wider slot 41. At the slotted end of the latch member 37 is an integral projection 43 having a slanted surface 45. On the side of the latch 37 opposite the projection 43 and on the opposite side of the slot 39 is an integral projection 47. The function of the projections 43 and 47 will be explained hereinafter.
The invention as defined in claim 1 wherein said flange receiving element has an elongated opening formed on both sides of said channel, said openings adapted to correspond with the slot in the projecting flange carried by said article, said interlocking portion being coplanar with said openings whereby said portion extends into said openings when turned transversely of said channel.

3. The invention as defined in claim 1 wherein said means for turning said interlocking portion comprises a handle having a tube projecting therefrom and extending to said flange receiving element, said tube being connected to said interlocking portion, said connection comprising a connecting portion extending between said tube and said interlocking portion.

4. The invention as defined in claim 3 including a pair of said interlocking portions carried by said tool, one of said portions being on each side of said flange receiving element, said interlocking portions being identical but oppositely directed.

5. The invention as defined in claim 3 wherein said tube is rotatable relative to said flange receiving element.

6. The invention as defined in claim 4 wherein each of said interlocking portions has a cam surface on the edge thereof remote from said channel.

7. The invention as defined in claim 6 wherein said tool is combined with said article, said interlocking portions extending transversely of said channel and of said slot in said flange of said article, said article having a latch engaging projection adjacent said flange, said cam surface of one of said inter-

8. The invention as defined in claim 7 wherein said tool is combined with said article, said interlocking portions extending transversely of said channel and of said slot in said flange of said article, said article having a latch engaging projection adjacent said flange, said cam surface of one of said inter-

9. The invention as defined in claim 8 wherein said article has a latch engaging projection adjacent said flange.
locking portions slidably contacting said projection whereby said latch is actuated by turning of said interlocking portions.

8. The invention as defined in claim 7 wherein said article comprises a printed circuit card, said card being slidable in and out of a container.

9. The invention as defined in claim 7 wherein said flange has a recess in the projecting edge thereof, said recess being of a length corresponding to the length of said flange receiving element, said flange receiving element fitting in said recess.