

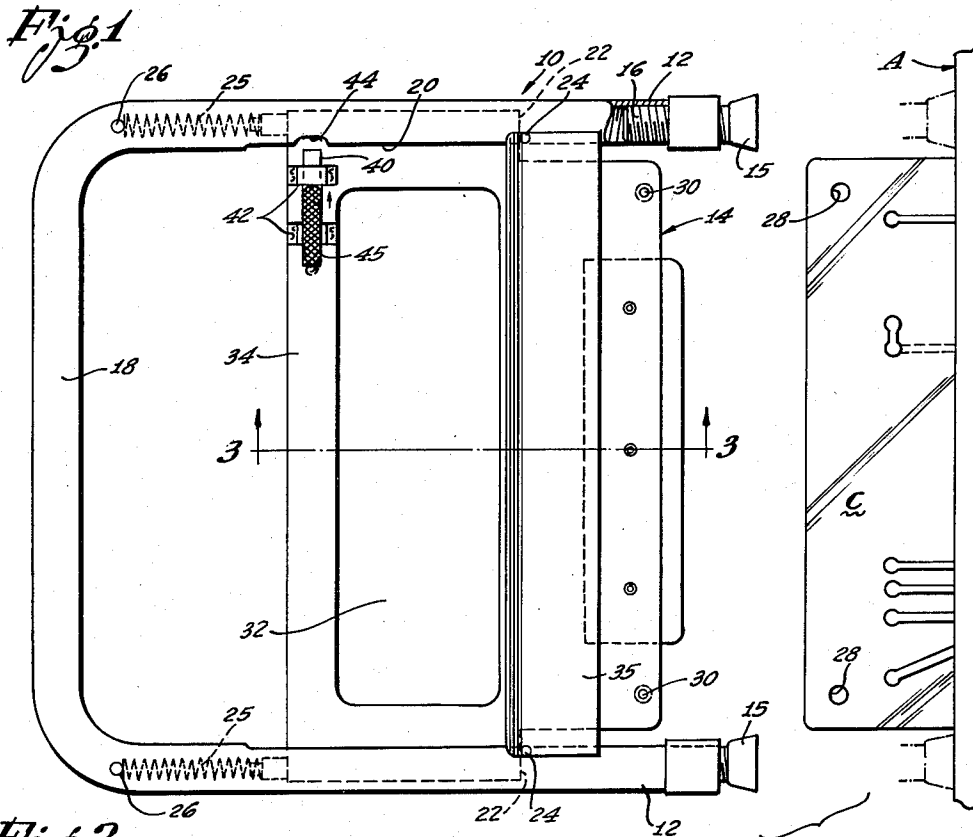
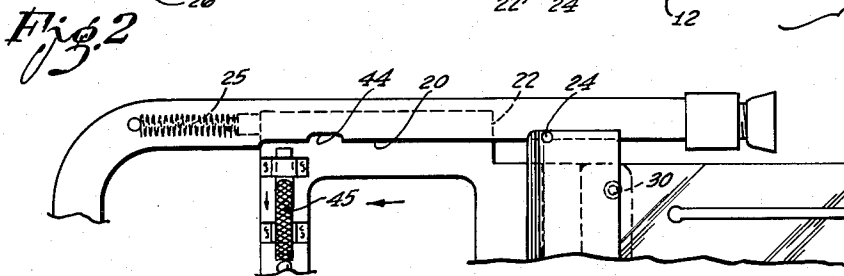
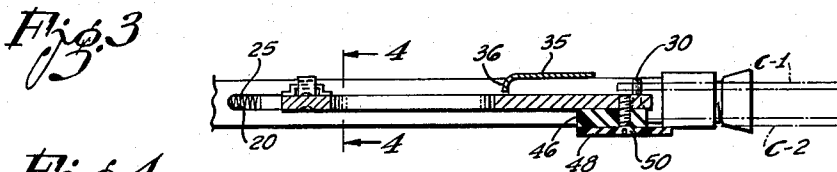
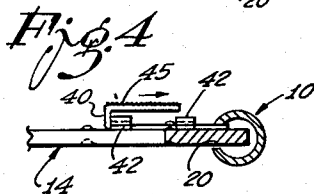
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DEVICE FOR HANDLING PRINTED CIRCUIT CARDS

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DEVICE FOR HANDLING PRINTED CIRCUIT CARDS

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This invention relates to a device for handling plate-
like printed circuit cards and more particularly refers to
such a device for use in withdrawing printed circuit cards
from electrical apparatus as well as for inserting the
cards.

Electrical apparatus of the character to which the in-
vention pertains has a row of closely spaced removable
printed circuit cards of plastic material, the opposite side
edges of the cards being retained by corresponding pairs
of guide grooves in the apparatus and the inner ends of
the cards being gripped by spring-like electrical contacts
for completing the electrical circuits. Each pair of guide
grooves, in effect, forms a slot in the apparatus to hold
the corresponding circuit card and to define the path of
movement of the circuit card into and out of the apparatus.
Each individual card has a pair of apertures near the two
corners of the card at its outer end whereby an installed
card may be engaged and withdrawn from the apparatus.
For example, a tool or any convenient device dimen-
sioned to enter one of the card apertures may be used
to engage an installed card and to overcome the frictional
grip of the spring contacts.

Such an improvised procedure for withdrawing a card
has several disadvantages in addition to being awkward
and time-consuming. A careless prying action may stress
the card to a damaging extent. It is also a disadvantage
that all of the pulling force is exerted at only one corner
of the card, one consequence being that the stresses are
concentrated at the selected aperture and another con-
sequence being that the pulling force is not aligned longi-
tudinally with the installed card. It is also a disadvantage
that after an installed card is initially loosened from the
spring contacts by means of a tool or instrument, a second
operation is required since the loosened card must be
subsequently manually gripped for complete withdrawal.
The manual gripping of the partially withdrawn card may
result in inadvertent damage to an electrical component
that is mounted on the card.

The present invention avoids all of these disadvantages
and difficulties by means of a manually operable card-
handling device that cooperates with both of the apertures
of the card and quickly and easily disengages the card
from the spring contacts of the apparatus by manual
gripping force. With the card initially loosened in this
manner, the device is employed to withdraw the card and
carry the card away from the apparatus. The whole with-
drawal operation is practically a single manual movement
because no time is lost between the gripping action that
initially loosens an installed card and the following hand
movement for completely withdrawing the card.

Since the device of the invention engages both corner
apertures of the card, the necessary stresses in the card
are divided between the two apertures. In addition, the
new device inherently applies pulling force that is accu-
rately aligned with the longitudinal axis of the installed
card. For this purpose, the card handling device straddles
the exposed end of an installed card to abut the front of
the electrical apparatus on opposite sides of the card.

The device comprises a first structure which may be
termed the straddling structure and a second structure
which is movable relative to the first structure and may
be termed a card-engaging structure. The first structure
has two arms positioned to straddle an end of a circuit

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card in the plane of the card. The card-engaging struc-
ture is provided with a pair of projections in the form of
pins to engage the apertures of an installed card. These
two relatively movable structures are formed with corre-
sponding handle portions which are normally spaced
apart. These two handle portions are adapted to be manu-
ally grasped for relative movement towards each other by
manual gripping pressure. The grip-induced relative
movement creates force between the straddling structure
and the card-engaging structure to withdraw the installed
card, the reaction to the withdrawal force being trans-
mitted to the apparatus by the stationary straddling
structure.

An important feature of the preferred embodiment of
the invention is the provision of means that automatically
locks the card on the two card-engaging pins in response
to the manual gripping action. For this purpose, the
straddling frame structure has a transverse guard member
positioned to overhang the two pins of the card-engaging
structure when the card-engaging structure is retracted
by manual gripping force. Thus when an installed card
is initially withdrawn from the spring contacts, the lead-
ing margin of the card is drawn under the transverse
guard. Thereafter the card is positively interlocked with
the card handling device so long as the card-engaging
structure is manually retained in its retracted position.

To install a printed circuit card, first the two apertures
of the card are engaged by the two pins of the card-
engaging structure. Then the device is manually gripped
to retract the end margin of the card to the locked posi-
tion under the transverse guard so that the card cannot
possibly be dropped from the handling device. The han-
dling device is then employed to maneuver the card into
the apparatus. With the card-engaging structure enga-
ging the two apertures of the card, it is not possible to force
the card completely into the apparatus by force applied
solely to the straddling structure, as will be readily un-
derstood from the detailed description of the device. A final
operation is ordinarily required to force the card into
engagement with the spring contacts of the apparatus to
complete the installation.

A feature of the invention is the provision of means
whereby the card handling device may also be employed
for this final insertion operation. In fact, the operator
has the choice of two provisions for this purpose. One
provision consists of a manually operable latch that may
be employed to hold the card-engaging means at its ad-
vanced position so that the necessary final insertion force
may be applied to the card through the straddling struc-
ture without a defeating retraction of the card-engaging
structure. The other provision, which may be utilized if
desired, consists simply of means carried by the card-
engaging structure at a position forward of the two pins
to exert a final push on the card.

The features and advantages of the invention may be
understood by reference to the following detailed descrip-
tion of the presently preferred embodiment of the inven-
tion and by reference to the accompanying drawing.

In the drawing, which is to be regarded as merely
illustrative:

FIG. 1 is a side elevation of the presently preferred
embodiment of the invention poised for movement in
position against an electrical apparatus to withdraw a
printed circuit card from the apparatus;

FIG. 2 is a fragmentary view similar to FIG. 1 show-
ing the card-engaging structure engaging a card and
retracted for positive retention of the card by the over-
hanging guard of the straddling structure;

FIG. 3 is a fragmentary longitudinal section taken along
the line 3—3 of FIG. 1 and illustrating the two ways in
which the card-engaging structure may push the card into
its installed position; and

FIG. 4 is a sectional view along the line 4—4 of FIG. 3 showing the latch engaged to hold the card-engaging structure advanced so that the pins 20 may be used in the manner shown in FIG. 3 to push a card to its final installed position.

The presently preferred embodiment of the invention shown in the drawing comprises a first U-shaped straddling structure, generally designated 10, with a pair of forwardly extending legs 12 and a second card-engaging structure, generally designated 14, which is movably mounted on the first structure to shift between a normal forward position and a retracted rearward position. In the construction shown, the first structure 10 comprises essentially a tube that is bent to a U-shaped configuration. The ends of the forwardly extending tubular legs 12 are adapted to abut the apparatus in which a printed circuit card is installed. One purpose of such abutment is to transmit to the apparatus the reaction of the withdrawal force that is applied to an installed card. A second purpose is to orient the device to exert a pulling force that is accurately aligned longitudinally of the installed card.

The two legs 12 may be provided with tips 15 of rubber-like material to avoid marring the surface of the apparatus. In the construction shown, the tips 15 are mounted on corresponding screws 16 which are threaded into the ends of the two legs 12. The transverse rear portion 18 of the U-shaped structure 10 may be termed a handle portion since it is used in the gripping action for withdrawing a card from the apparatus.

The second card-engaging structure 14 may comprise essentially a plate that is slidably mounted on the two legs 12 of the straddling structure 10. In the construction shown, the two tubular legs 12 are provided with longitudinal slots 20 into which the card-engaging structure 14 slidably extends. The card-engaging structure 14 has shoulders 22 which abut corresponding stop pins 24 in the tubular legs 12 at the normal forward position of the structure. To urge the card-engaging structure towards this normal position, a coil spring 25 is mounted inside each of the two legs 12 under compression between the card-engaging structure 14 and a rearward cross pin 26. The card-engaging structure 14 may be retracted against the resistance of the two coil springs 25 to a limit position in abutment with the rear ends of the two slots 20. The range of movement of the card-engaging structure 14 is sufficient to disengage an installed printed card from the spring contacts of the apparatus that frictionally grip the inner end of the card.

The drawing shows a printed circuit card, generally designated by the letter "C," which is provided with the usual pair of apertures 28 near its forward two corners for the purpose of facilitating manipulation of the card. The card-engaging structure 14 of the card handling device is provided with suitable lateral projections to interconnect the two apertures 28. In the construction shown, the two lateral projections are in the form of pins 30.

To permit manual retraction of the card-engaging structure 14 by gripping action, it has a transverse opening 32 large enough to receive the fingers of the operator's hand, which opening forms a second handle portion 34. This second handle portion 34 is spaced forward from the previously mentioned first handle portion 18 of the straddling structure 10 so that the two handle portions may be grasped manually for retraction of the card-engaging structure 14 by manual gripping force.

As heretofore stated, a feature of the invention is the provision of a guard on the straddling structure 10 to lock an engaged card on the card-engaging structure 14 automatically when the card-engaging structure is retracted. For this purpose, a thin transverse guard plate 35 may fixedly interconnect the two legs 12 of the U-shaped structure 10 in a position to overhang the two pins 30 when the card-engaging structure 14 is retracted. This transverse guard plate 35 may be welded or brazed

to the two legs 12 and may be formed with a curved edge 36 that is turned towards the card-engaging structure 14. It is apparent that the guard plate 35 not only serves its primary locking purpose but also strengthens the straddling structure 10 by rigidly interconnecting the two legs 12.

For the purpose of withdrawing a card from an apparatus that is generally designated by the letter "A," the operator grasps the device by the two handle portions 18 and 34 and places the tips 15 of the straddling structure 10 against the apparatus in a position straddling the installed card. The installed card is straddled edgewise, which is to say that the two legs 12 are in the same plane as the installed card. In placing the device in this position, the operator maneuvers the two pins 30 of the card-engaging structure 14 into the two card apertures 28.

The operator then tightens his grip on the two handle portions 18 and 34 to retract the card-engaging structure 14 thereby pulling the installed card free from the spring contacts of the apparatus. With the card initially dislodged in this manner by retraction of the card-engaging structure 14, the guard plate 35 overhangs the edge of the card and the pins 30 as shown in FIG. 2 to lock the card on the two pins 30. The operator then draws the device rearward away from the apparatus to pull the card completely out of the apparatus. Actually, this final pulling action follows the gripping action so closely that the two actions in effect constitute a single operation. The operator sustains the grip pressure on the two handle portions 18 and 34 to keep the card secure and in this manner carries the card away from the apparatus without danger of the card being dropped.

To install a card in the apparatus, the card is engaged by the two pins 30 and the two handle portions are again gripped to retract the card-engaging structure 14 to make the guard plate 35 effective for locking the card. The device is then used to reinsert a card. It is to be noted, however, that a card cannot be completely inserted by means of the pins 30 unless the card-engaging structure 14 is prevented from retracting against the yielding resistance of the springs 25. As heretofore stated, the preferred practice of the invention provides a latch means to releasably hold the card-engaging structure 14 from retraction whereby the pins 30 may be employed to complete the insertion of a card and force the card into engagement with the spring contacts of the apparatus.

In the construction shown, the latch means comprises a latch member 40 that is slidably mounted on the card-engaging structure 14 by a pair of brackets 42. The latch member 40 is adapted to frictionally maintain either a retracted position or an alternate latching position at which the latch member extends into a latching recess 44 in the adjacent tubular leg 12 of the straddling structure 10. The latch member 40 may be of the angular configuration shown to provide a convenient thumb piece 45 which may have a serrated surface, as shown.

If the operator desires to use the two pins 30 to force a printed circuit card into its final position in the apparatus, the latch member 40 is shifted by thumb pressure to its effective position to maintain the card-engaging structure 14 in its normal position in a manner that will withstand rearward pressure. The pressure for forcing the card to its final position is then applied manually by pushing against the handle portion 18 of the straddling structure 10, the pressure being transmitted through the latch member 40 to the card-engaging structure 14. In FIG. 3, the pins 30 are pushing a card C-1.

As heretofore stated, a feature of the presently preferred embodiment of the invention is the provision of an alternate means that may be used to carry out this final pushing operation without the necessity of using the latch member 40. In the present construction, this alternate means comprises a pair of plates 46 and 48 that are secured together and anchored to the card-engaging structure 14 by suitable screws 50. These two plates 46 and 48 may be made of plastic material. The

inner plate 46 which is used to abut or push against the card is set back slightly from the forward edge of the card-engaging structure 14 and the outer plate 48 is positioned forward to overhang the inner plate. This arrangement provides a transverse groove to seat the end edge of the card to keep the device in engagement with the card during the pushing operation.

It is to be noted that when a card is abutted by the inner plate 46, the edge of the card is spaced forward from the position the card would take if it were engaged by the two pins 30. Thus, in FIG. 3, the card C-2 is advanced relative to the card C-1. It is this forward spacing which permits the card-engaging structure 14 to push a card into its fully installed position while the card-engaging structure 14 is completely retracted. Thus if only the handle portion 18 of the straddling structure 10 is used to apply the pressure for pushing a card into its fully installed position while the card is abutted by the edge of the inner plate 46, the card-engaging structure 14 may fully retract against the resistance of the springs 25 and still be advanced sufficiently to force the card all the way to the desired installed position.

My description in specific detail of the selected embodiment of the invention will suggest various changes, substitutions and other departures from my disclosure within the spirit and scope of the appended claims.

I claim:

1. A device for withdrawing an apertured plate-like printed circuit card endwise from a slot in an electrical apparatus, comprising: a first structure having a first rearwardly positioned handle portion and having a forward portion for abutment against the apparatus adjacent the installed card; a second structure movably mounted on said first structure for shift relative thereto between a normal forward position and a retracted rearward position, said second structure having a forward portion shaped to engage the apertured portion of the card and having a rearwardly positioned second handle portion forward of said first handle portion to be manually gripped together with said first handle portion for retraction of the second structure whereby said first structure may be placed against said apparatus with said second structure engaged with a card in the apparatus and then said two handle portions may be gripped for retraction of the second structure and consequent withdrawal of the card from the apparatus with the reaction to the withdrawal force transmitted to the apparatus; and means to lock the card on the card-engaging structure in response to retraction thereof.

2. A device as set forth in claim 1 which includes yielding means acting between said two structures to urge said second structure toward its forward position.

3. A device as set forth in claim 1 in which said forward portion of the first structure for abutment against the apparatus is shaped and dimensioned to straddle the installed card edgewise thereof in the plane of the card with clearance relative to the path of withdrawal of the card that is defined by said slot.

4. A device for manipulating an apertured plate-like circuit card which is normally slidably mounted in an electrical apparatus, including, a first structure having a handle and a pair of legs extending from the handle with a spacing greater than the width of the circuit card, the legs being adapted for disposition against the apparatus to facilitate the movement of the card into and out of the apparatus, a second structure having a forward portion and a rearward portion separated from one another by an opening for disposition of the fingers of the hand in the opening, there being slots in the legs of the first structure for receiving the second structure for slidable movement of the second structure relative to the first structure in the forward and reverse directions upon a manipulation of the first and second structures, spring means disposed relative to the legs of the first structure and constrained relative to the second structure for urging the

second structure in the forward direction relative to the first structure, and pin means disposed on the forward portion of the second structure for extending into the apertures of the circuit card to grip the circuit card between the legs of the first structure for movement with the second structure in the forward and reverse directions.

5. The device set forth in claim 4 in which guard means are disposed on the first structure at a position relative to the second structure and are shaped relative to the second structure to lock the circuit card against removal upon the movement of the second card to the rearward position relative to the first card.

6. The device set forth in claim 4 in which latch means are disposed relative to the first and second structures to latch the first structure against movement relative to the second structure in the forward position of the second structure relative to the first structure.

7. The device set forth in claim 4 in which a guard plate extends outwardly and forwardly from the legs of the first structure to receive the circuit card upon a rearward movement of the second structure relative to the first structure and to prevent the circuit card from being removed from the device upon such rearward movement and in which latch means are adjustably disposed relative to the first and second structures to obtain a unitary movement of the first and second structures in the forward position of the second structure relative to the first structure.

8. The device set forth in claim 7 in which the latch means includes an adjustable thumb piece on the second structure and further includes a recess in one of the legs of the first structure for receiving the thumb piece upon an adjustment of the thumb piece.

9. A device for manipulating a plate-like printed circuit card which is normally slidably mounted in a slot in an electrical apparatus and which has apertures near its end edges to facilitate manipulation thereof, said device comprising:

- a first structure having a first rearwardly positioned handle portion and a forward portion for abutment against said apparatus in spaced relation to the path of movement of the card that is defined by said slot;
- a second structure movably mounted on said first structure for shift relative thereto in the plane of said slot between a normal forward position and a retracted rearward position, said second structure having a forward portion provided with lateral projections for engagement with the card by insertion into said apertures, said second structure having a rearwardly positioned second handle portion forward of said first handle portion to be manually gripped together with said first handle portion for retraction of the second structure whereby said first structure may be placed against said apparatus with said second structure engaged with a card in the apparatus and then said two handle portions may be gripped for retraction of the second structure and consequent withdrawal of the card from the apparatus along said path without distorting interference by said first structure with the reaction to the withdrawal force transmitted to the apparatus; and
- a guard fixedly mounted on said first structure in position to overlap the apertured portion of the card when the card is engaged by said projections and said second frame structure is retracted by gripping force whereby the guard locks the card on said projections so long as the gripping force is sustained.

10. A device for manipulating an apertured plate-like circuit card which is normally slidably mounted in an electrical apparatus, including,

- a first structure having a rearwardly positioned handle portion and having a pair of legs disposed in spaced relationship on opposite sides of the plate-like circuit card and extending forwardly from the handle

- portion for engagement with the apparatus to obtain a transfer of the circuit card into and out of the apparatus,
- a second structure supported between the legs of the first structure in slidable relationship with respect to the legs in the forward and rearward positions, the second structure having a forward portion for engaging the circuit card and having a rear portion for manual cooperation with the handle on the first structure to facilitate the forward and rearward movement of the second structure relative to the first structure,
- spring means disposed relative to the first and second structures for urging the second structure in the forward direction relative to the first structure,
- means on the forward portion of the second structure for extending into the apertures in the plate-like circuit card to grip the circuit card for movement with the second structure; and
- means on the first structure for locking the circuit card against removal from the device upon the movement of the second structure to the rearward position relative to the first structure.
11. A device for manipulating an apertured plate-like circuit card which is normally slidably mounted in an electrical apparatus, including,
- a first structure having a rearwardly positioned handle portion and having a pair of legs disposed in spaced relationship on opposite sides of the plate-like circuit card and extending forwardly from the handle portion for engagement with the apparatus to obtain a transfer of the circuit card into and out of the apparatus,

- a second structure supported between the legs of the first structure in slidable relationship with respect to the legs in the forward and rearward positions, the second structure having a forward portion for engaging the circuit card and having a rear portion for manual cooperation with the handle on the first structure to facilitate the forward and rearward movement of the second structure relative to the first structure,
- spring means disposed relative to the first and second structures for urging the second structure in the forward direction relative to the first structure,
- means on the forward portion of the second structure for extending into the apertures in the plate-like circuit card to grip the circuit card for movement with the second structure; and
- guard means on the first structure and disposed relative to the second structure for providing for a removal of the circuit card from the device in the forward position of the second structure relative to the first structure and for providing a retention of the circuit card by the device upon a movement of the second structure to the rearward position relative to the first structure.

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