United States Patent

[11] **3,628,840**

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[45] Patented **Dec. 21, 1971**

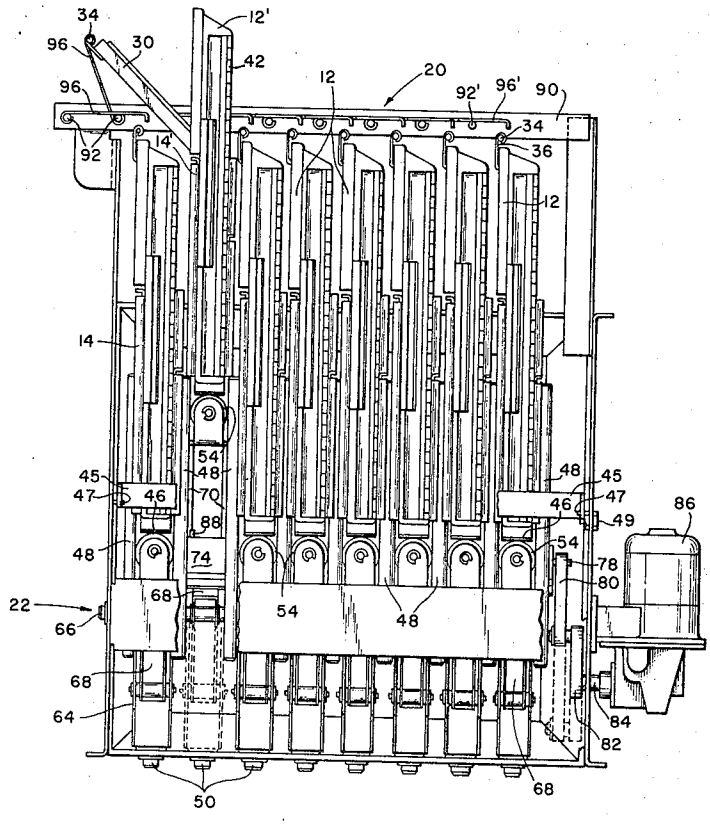
[54] **AUTOMATIC DISPENSER AND STORAGE DEVICE FOR SHEET FILM**
13 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** ..... **312/35,** 250/66, 312/42, 206/1 A
[51] **Int. Cl.** **A47f 4/00**
[50] **Field of Search** ..... 312/35, 42, 50, 60; 206/1 A; 220/29; 221/126, 129; 250/65, 66

[56] **References Cited**
UNITED STATES PATENTS
3,150,263 9/1964 Catlin 250/66

Primary Examiner—James C. Mitchell
Attorneys—Robert W. Hampton and Milton S. Sales

ABSTRACT: An automatic dispenser for sheet material includes a magazine having a plurality of carriers, each carrier being adapted to receive a cartridge-containing sheet material. The magazine further includes a lifting device for raising a selected carrier and its associated cartridge and means responsive to upward movement of a carrier for opening an access door on the associating cartridge to permit withdrawal of a sheet carried therein.



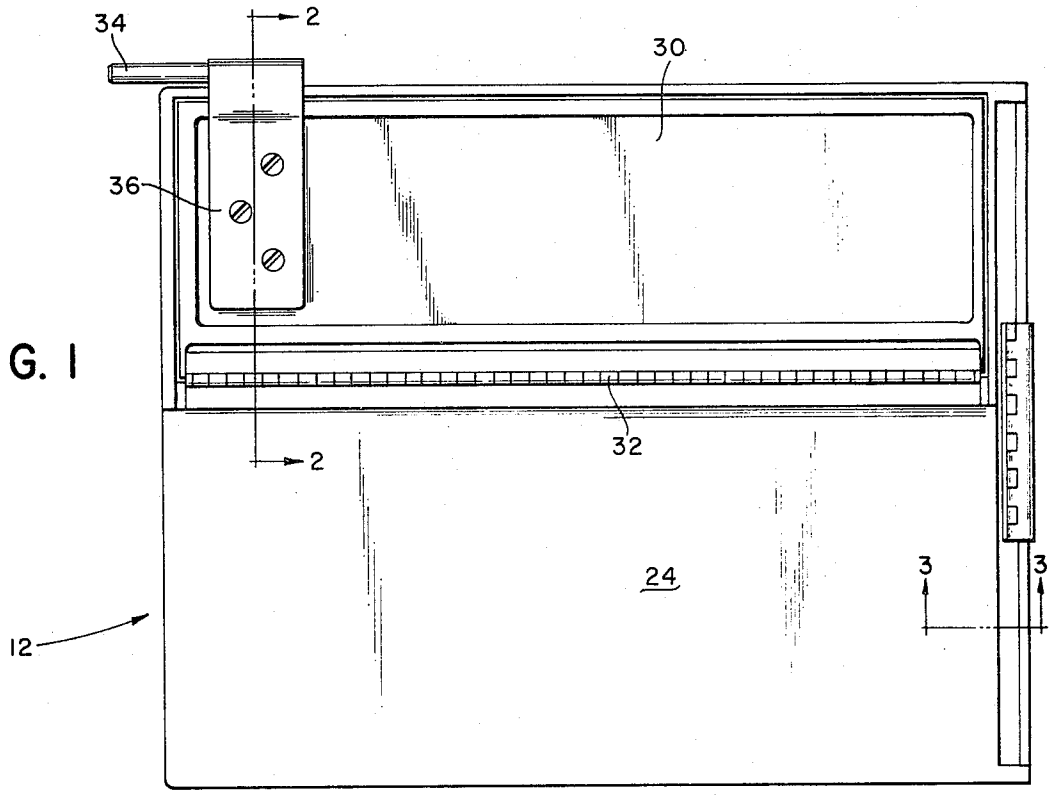


FIG. 1

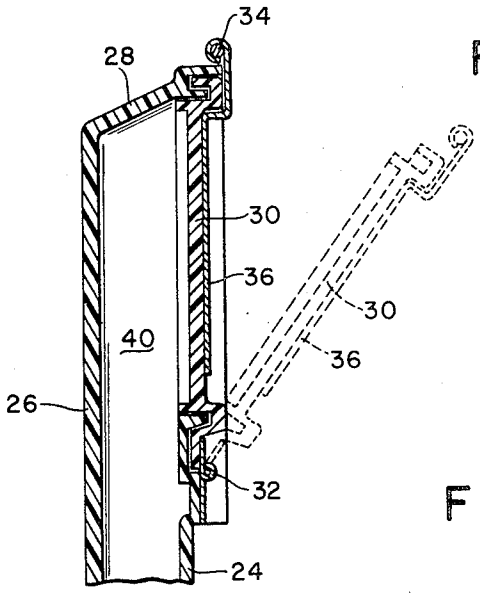
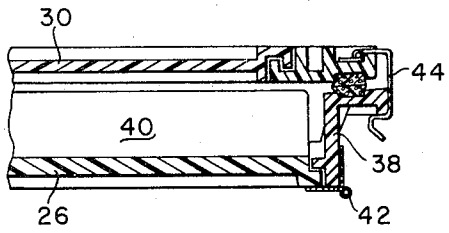


FIG. 2

FIG. 3



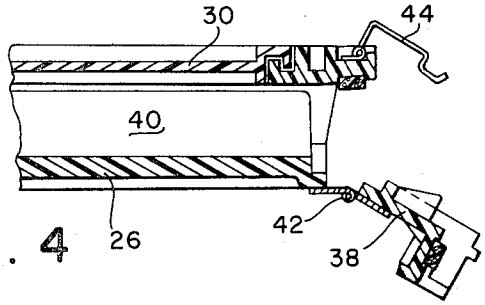


FIG. 4

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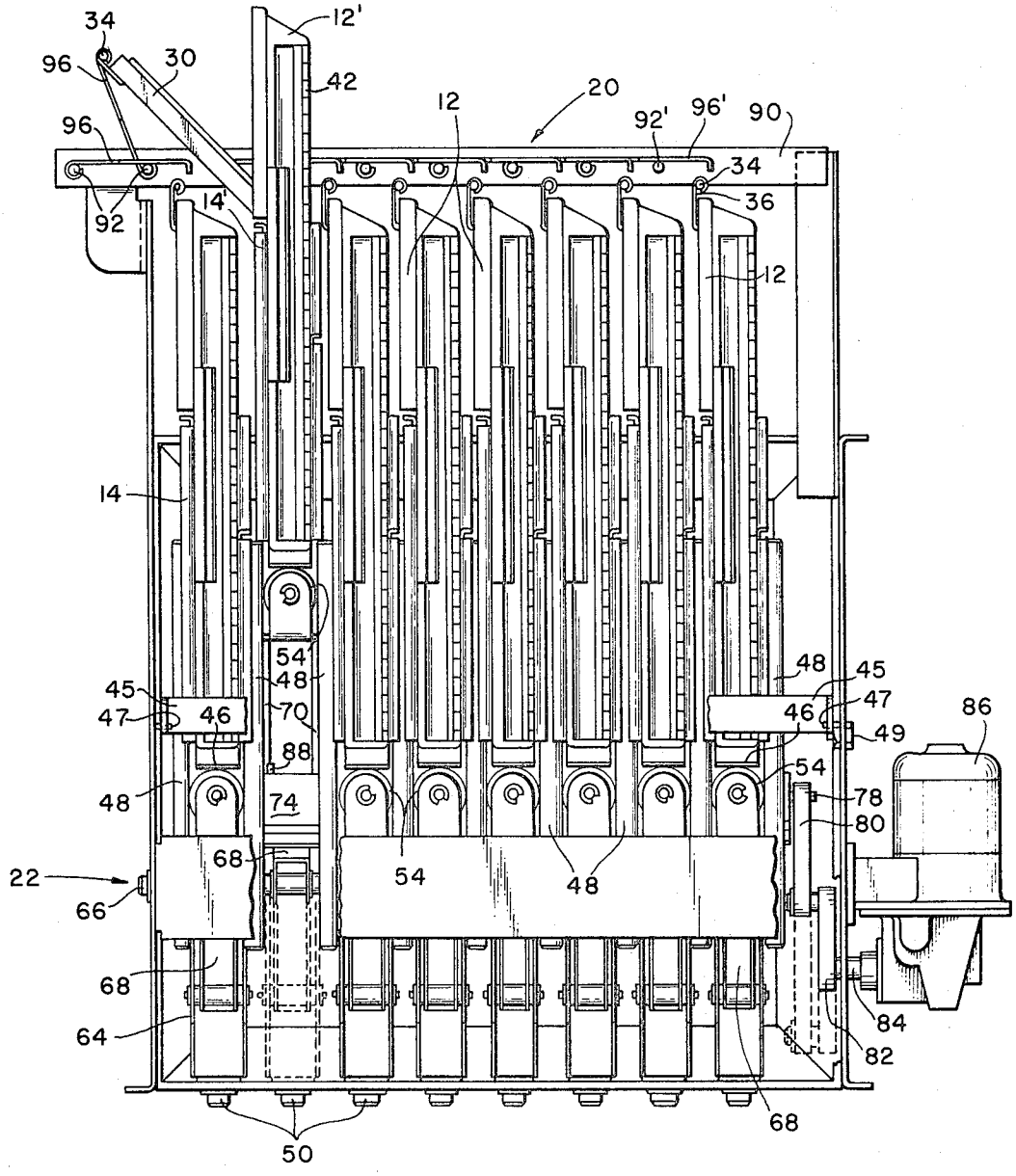


FIG. 5

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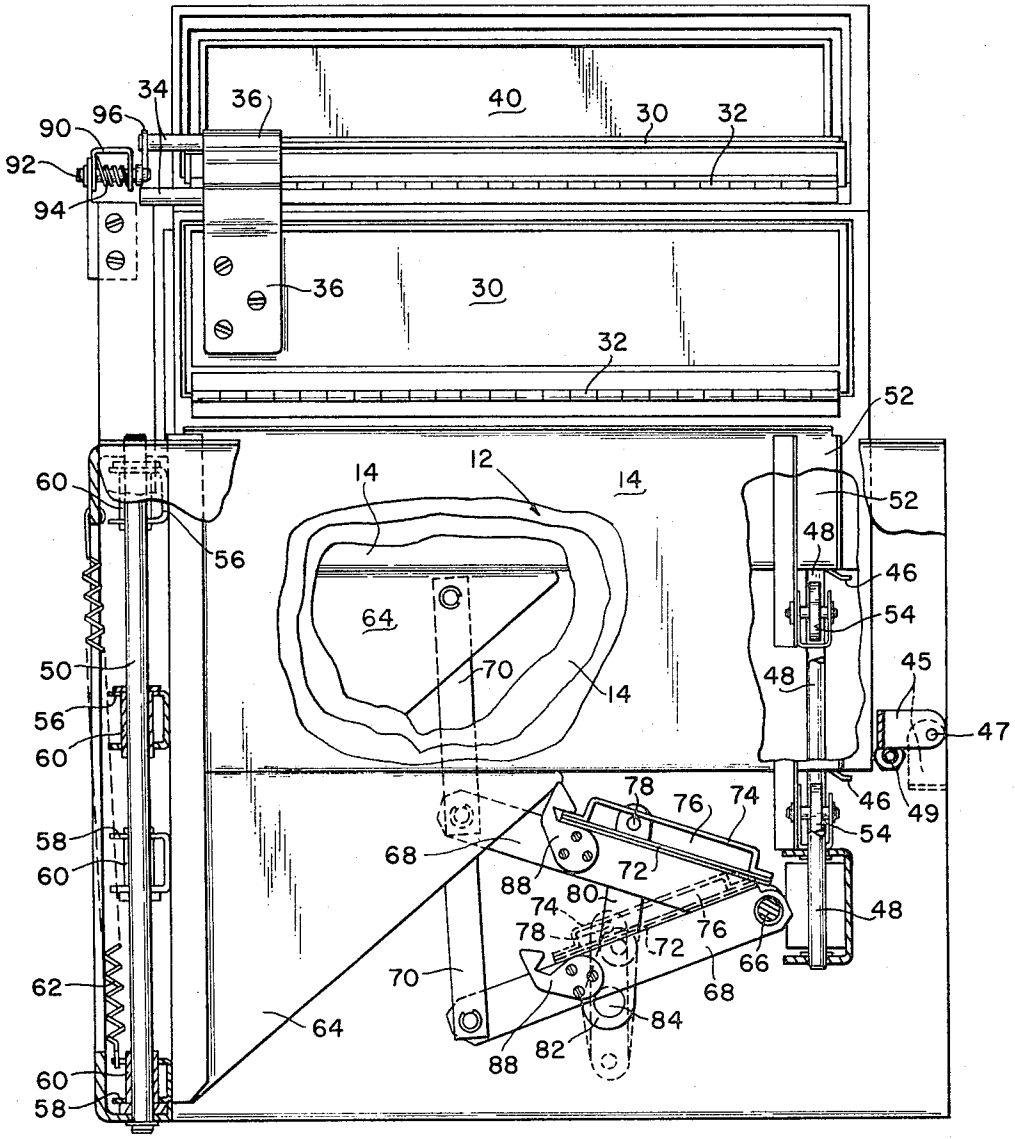


FIG. 6

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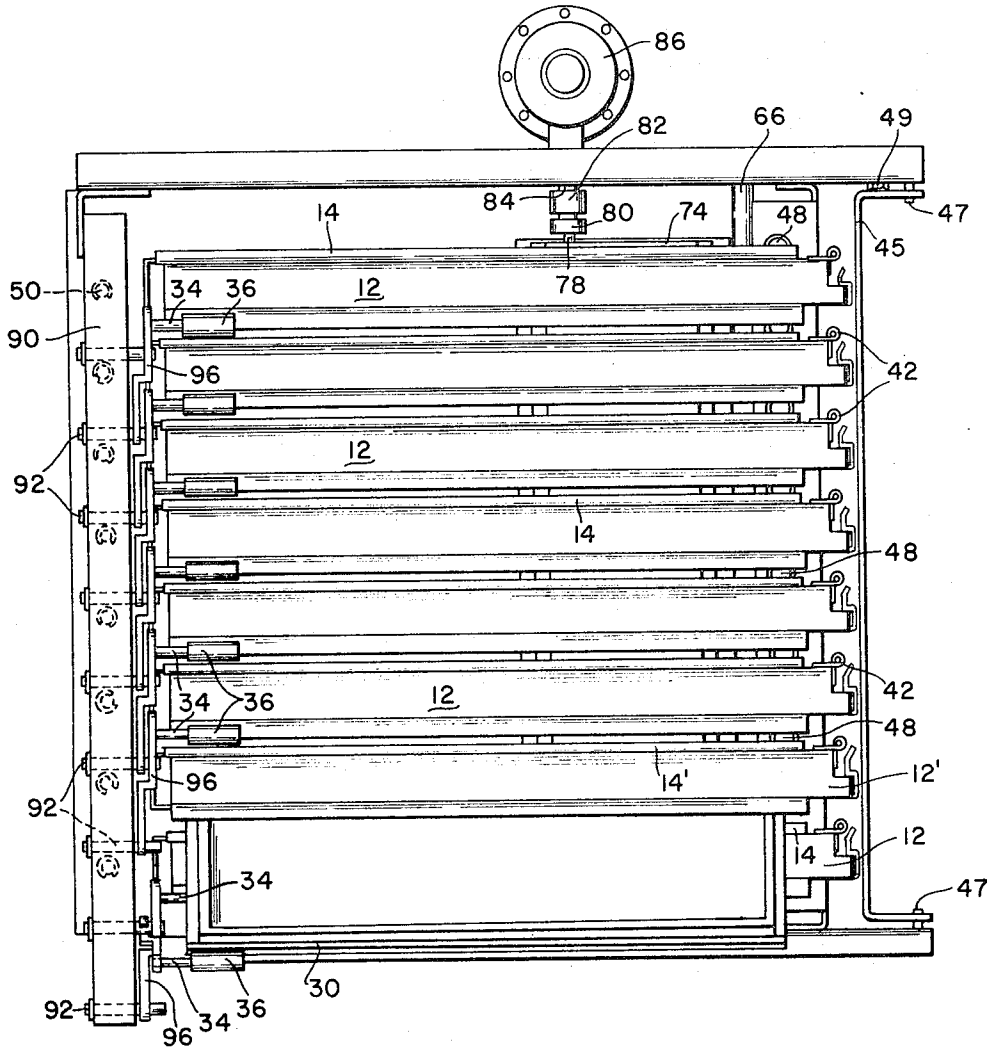


FIG. 7

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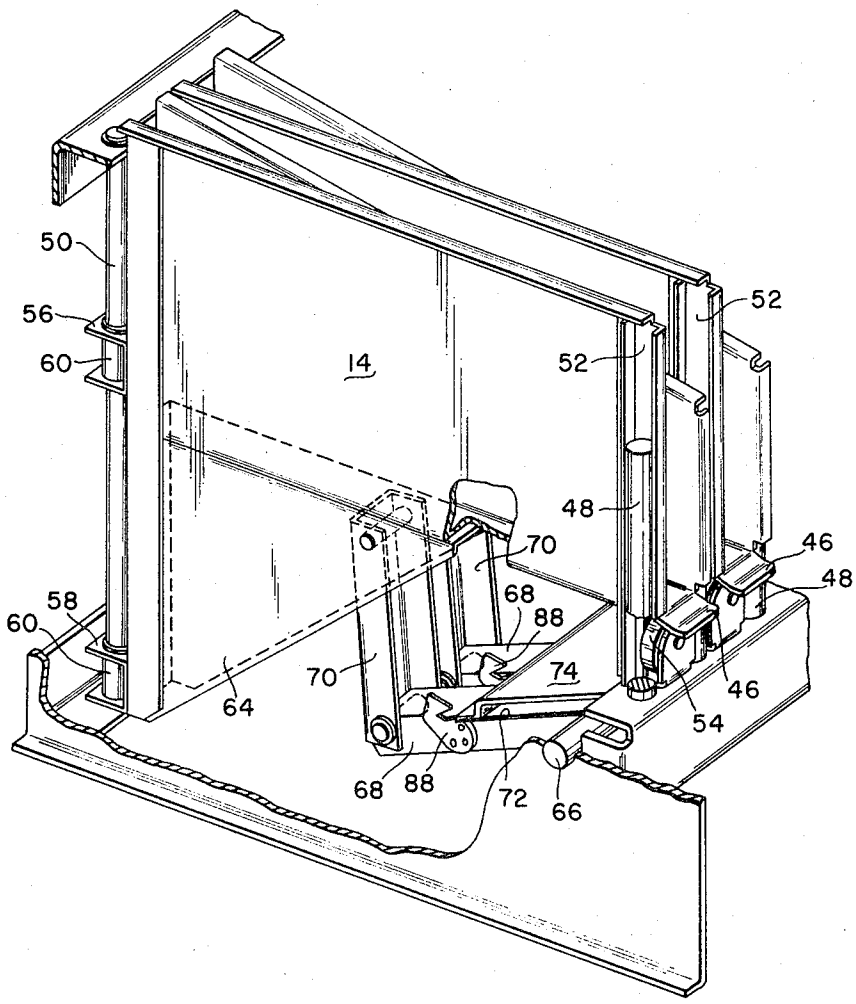


FIG. 8

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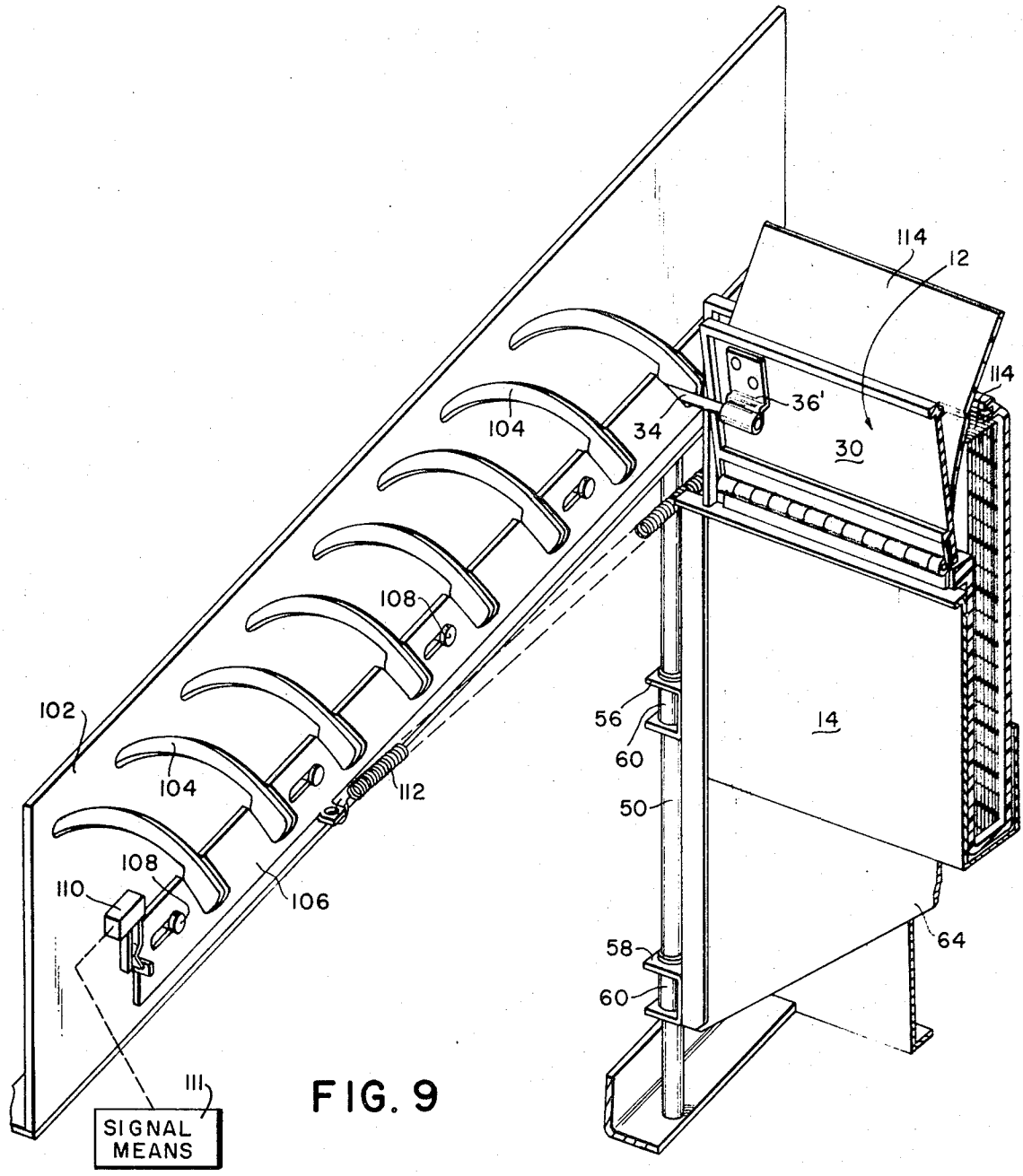


FIG. 9

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AUTOMATIC DISPENSER AND STORAGE DEVICE FOR SHEET FILM

CROSS REFERENCES TO RELATED APPLICATIONS

Reference is made to commonly assigned copending U.S. Pat. applications Ser. No. 794,032 entitled AN AUTOMATIC CASSETTE LOADER AND UNLOADER FOR SHEET FILM, filed concurrently herewith in the names of Patricia M. Andrus and Charles J. Kunz, and serial No. 765,948 entitled FILM CASSETTE AND METHOD OF USE, filed Oct. 8, 1968 in the name of Normal N. Lareau.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates broadly to automatic cassette unloading and reloading machines, and more particularly to a magazine for supplying fresh sheet material such as unexposed film to be reloaded into a cassette after removal of the exposed film.

2. Description of the Prior Art

Various types of cassettes for sheet material are known in the art. The present invention is primarily intended for use in conjunction with cassettes adapted to receive a single sheet of film such as X-ray film, to house the film during photographic exposure, to have the exposed film removed and to be reloaded with a fresh sheet of unexposed film. Such a cassette is described in commonly assigned copending U.S. Pat. application Ser. No. 765,948, entitled FILM CASSETTE AND METHOD OF USE, filed Oct. 8, 1968 in the name of Norman N. Lareau. Although that application discloses a specific type of cassette, it is referred to herein only as an example, many other types of cassettes being usable in conjunction with the present invention.

Machines for automatically unloading exposed film from a cassette of the type described above and reloading that cassette with unexposed film are well known in the art. One such machine is described in commonly assigned copending U.S. Pat. application Ser. No. 794,032, entitled AN AUTOMATIC CASSETTE LOADER AND UNLOADER FOR SHEET FILM, filed concurrently herewith in the names of Patricia M. Andrus and Charles J. Kunz. In machines of this type, it is desirable, and the purpose of the present invention, to provide a supply of fresh film within the machine so that the cassette-reloading process can be carried out automatically, the attention of the operator being needed only when the supply of fresh film in the magazine has been exhausted. In these machines, it is a practice to provide the capability of handling various sizes of cassettes and types of film or other sheet material. Therefore, the magazine must necessarily be capable of supplying film of varying size and type upon demand.

One such mechanism for performing this function is described in U.S. Pat. No. 3,150,263 to Kenneth K. Catlin. In this mechanism, cassettes containing exposed film are fed into an unloading and reloading machine where they are opened and the exposed sheet of film is removed. A plurality of horizontal magazines, one for each type and size of film, are carried in the machine above the cassette position and a series of film guide chutes extend from positions adjacent each magazine to just above the open cassette. A number of suction cups, one for each magazine, are pivotally mounted for movement between the magazines and the guide chutes When a magazine corresponding to the size film to be loaded into the open cassette is opened, each of the suction cups is lowered. Only that cup adjacent the open magazine will contact the film. After vacuum is applied to the cups, their movement is reversed and a sheet of film from an open magazine is carried to a corresponding guide chute where it is released to travel down the chute to the waiting cassette. Each magazine is formed of a boxlike enclosure open at the end adjacent the suction cups and of a tray slidable therein. The tray is normally held retracted in the box by springs. A spring closed door is provided on the open side of the box and is pushed open by forward movement of the tray which is powered by a hydraulic ram. A ram and associated mechanism is required for each magazine.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a cartridge having improved means for permitting removal of a single piece of sheet material.

It is another object of the present invention to provide a magazine for sheet material having an improved means for presenting a piece of material for removal from the magazine.

It is still another object of the present invention to provide a magazine for sheet material having means to receive a plurality of cartridges and having a mechanism for lifting a selected cartridge, the cartridges being openable automatically upon being raised.

In accordance with a preferred embodiment of the invention, a plurality of cartridges are carried in a magazine in a side-by-side relationship. Although the nomenclature "cartridge" and "cassette" is sometime used interchangeably in the art, I have herein used "cartridge" to refer to that part of the magazine of the present invention which carries the sheet material supply and "cassette" to refer to the device to be loaded with sheet material from the cartridge. Each cartridge has a side door through which a supply of sheet material may be loaded and an access door through which individual sheets may be removed. The access door is provided with a shaft for cooperation with a mechanism on the magazine which automatically opens the access door when the cartridge is raised. To raise selected cartridges, a motor raises and lowers a lifting device normally independently of the cartridges. A cartridge which has been selected to be raised is latched to the lifting device to be raised therewith.

The invention, and its objects and advantages, will become more apparent in the detailed description of the preferred embodiments presented below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is made to the accompanying drawings, in which:

FIG. 1 is a front elevational view of the cartridge of the present invention;

FIG. 2 is a sectional view taken along line 2—2 in FIG. 1;

FIG. 3 is a sectional view showing the sheet material loading door in its closed position taken along line 3—3 of FIG. 1;

FIG. 4 is a sectional view similar to FIG. 3 showing the sheet material loading door in its open position;

FIG. 5 is a side elevational view partially in section of the magazine of the present invention;

FIG. 6 is a front elevational view partially in section of the magazine shown in FIG. 5;

FIG. 7 is a top view of the magazine shown in FIGS. 5 and 6;

FIG. 8 is an enlarged perspective view of the cartridge raising device of the present invention; and

FIG. 9 is a perspective view of an alternative embodiment showing the cartridge-opening mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The sheet material magazine to be described herein is intended primarily for use in a cassette unloading and loading machine as described in the above-mentioned application filed in the names of Patricia M. Andrus and Charles J. Kunz. For that reason, detailed description of the unloader and loader machine have been omitted for this application, and the reader is referred to that application for details of the unloading and loading machine. The present description will be directed in particular to elements forming part of, or cooperating more directly with, the magazine forming the present invention.

Referring briefly to FIG. 5, the general components of the magazine are shown. In the central region of the magazine, a plurality of cartridges 12 are held in an equal number of sheet

metal carriers 14. One cartridge 12' and its associated carrier 14' are shown in a raised position. A mechanism denoted generally by reference numeral 20 is provided on the magazine frame to open the doors of the cartridges as the cartridges are raised. Details of this operation will be later described. Below carriers 14, a mechanism denoted generally by reference numeral 22 is provided to raise selected cartridges and carriers.

Referring now to FIGS. 1–4, details of the individual cartridges 12 will be explained. Each cartridge is formed generally in the shape of a rectangular box having a front panel 24, a rear panel 26 and a plurality of sidewalls 28. Front panel 24 carries lighttight door 30 pivotally mounted about hinge 32.

A pin 34 is mounted on door 30 by a bracket 36. Pin 34 extends above and to left of cartridge 12 as shown in FIG. 1 and is provided to cooperate with door-opening device 20 of the magazine frame. FIG. 2 shows a cross section of door 30 in its closed position and in its open position, the latter being shown in phantom lines.

Door 30 is provided for removal of sheet material which has been preloaded into cartridge 12. Removal is preferably carried out by the process described in the above-noted, copending application. A second door 38 is provided along one side of cartridge 12 for loading sheet material into a cavity 40 defined by the front and rear panels and the sidewalls of the cartridge. Door 38 is pivotally carried by a hinge 42, and is held in the closed position shown in FIG. 3 by a clasp 44. FIG. 4 shows the door in its open, sheet material receiving position.

Referring back to FIG. 5, a plurality of sheet metal carriers 14 are mounted for vertical movement within the magazine frame. Each carrier is formed in a generally U-shape as best seen in FIGS. 5 and 8. The front or near side of the carriers as seen in FIG. 5 are left open to receive cartridges 12, a lip 46 being provided below the front opening of the carriers to guide the cartridges into the carrier. Once in the carriers, cartridges 12 are locked in place by a bracket 45 (FIG. 6) which is pivotally mounted at 47 for movement between a lower position shown in phantom and a lock position resting on stud 49.

Each carrier 14 is mounted for vertical movement in the magazine frame and is guided by a pair of front guide rods 48 and a single rear guide rod 50. Guide rods 48 cooperate with channels 52 formed by any suitable means on carriers 14 such as welding angle iron to the outside of the carriers. A roller 54 mounted on each carrier below lip 46 serves to lessen the frictional contact between the carrier and front guide rods 48.

The rear of each carrier 14 is provided with upper and lower brackets 56 and 58, respectfully. Each bracket carries a bearing member 60 for sliding movement along rear guide rods 50. Each lower bracket 58 is attached to one end of a coil spring 62, FIG. 6, which partially offsets the weight of the carrier and cartridge. As can be best seen in FIG. 6, carriers 14 are provided with extensions 64 to which lower brackets 58 are secured.

As mentioned above, carriers 14 are mounted for vertical movement along guide rods 48 and 50. The apparatus for lifting selected carriers and their associated cartridges is mounted in the lower region of the magazine. A horizontal shaft 66 is carried in the magazine frame. A plurality of levers 68, one for each carrier, are pivotally mounted at one of their ends to shaft 66. The other end of levers 68 are connected to a second set of levers 70 of like number, levers 70 being attached to extensions 64 of carriers 14.

A plate 72 is also pivotally mounted at its ends about shaft 66 and extends above each lever 68. Plate 72 has a top portion 74 fastened thereto and forming a space 76 through which a rod 78 extends. Rod 78 is connected at one end to a lever 80 which is in turn pivotally mounted to a crank arm 82 carried by a rotatable shaft 84. Shaft 84 is powered by a motor 86. When crank arm 82 is in its lowered position shown in phantom lines in FIG. 5, plate 72 is rotated in a counterclockwise direction about shaft 66 to the position shown in FIG. 8. Upon actuation of motor 86, shaft 84 rotates through 180° to raise crank arm 82, lever 80 and rod 78 to the positions shown in FIG. 6.

Normally plate 72 is raised independently of levers 68. However, each lever 68 carries a rotatably mounted catch 88 which is activated by a solenoid, not shown, to clamp the lever to plate 72. The solenoids are independently operated so that a single lever 68 corresponding to the cartridge to be raised is clamped to plate 72 while the other levers 68 are left free of plate 72. When one lever 68 has been clamped to plate 72, rotation of shaft 84 through 180° will lift plate 72 and the lever 68 clamped thereto, resulting in the raising of the corresponding carrier 14 and cartridge 12. Rotation of shaft 84 through an additional 180° will lower the raised apparatus.

As a cartridge 12 is raised by the lifting mechanism previously described, its door 30 is automatically opened. The mechanism provided for opening the door is shown at the top of the magazine frame. A channel member 90 is mounted at the top left side of the magazine as seen in FIG. 6. This channel member carries a plurality of pivotally mounted pins 92 which are biased by springs 94 for rotation in clockwise direction as viewed in FIG. 5. Each pin carries a finger 96 which normally extends to the right as shown in FIG. 5 and rests upon the adjacent pin. The rightmost finger 96' rests upon an abutment 92' rather than a pin.

As a cartridge is raised, such as cartridge 12' in FIG. 5, its door pin 34 engages one of the fingers 96. That finger rotates counterclockwise about its pin 92 against a biasing force of spring 94. Finger 96 travels in a path which, in cooperation with pin 34, opens door 30 of cartridge 12'. A piece of sheet material may now be removed from the cartridge and motor 86 reactivated to lower the cartridge, the lowering motion automatically closing door 30.

FIG. 9 shows a second embodiment of the cartridge door opening device. In the foreground of the drawing, a carrier 14 and its associated cartridge are shown, like reference numerals being used to depict parts corresponding to those in the previous described embodiment. The door-opening apparatus includes a cam plate 102 with a series of cutouts 104 arranged to guide pins 34 of cartridges 12 so that doors 30 of the cartridges will be opened as the cartridges are raised. Only one cartridge is shown, and its pin 34 is shown mounted on door 30 by a slightly different bracket 36'. A lockout plate 106 is slidably carried on a series of rivets 108 on cam plate 102. An electrical switch 110 is closed when plate 106 is in the leftwardly position shown in FIG. 9. Switch 110 is electrically connected to a device 111 for signaling the operator and for shutting down operation of the automatic unloader and loader machine. Normally, lockout plate 106 is held to the right by a tension spring 112. However, should the mechanism for removing a piece of sheet material from cartridge 12 malfunction and a piece of sheet material remain partially extending from door 30 such as the piece shown as 114 in FIG. 9, door 30 will not close properly and pin 34 will be forced to the left. Pin 34 will carry lockout plate 106 leftwardly to close switch 110, alerting the operator and shutting down machine operation.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. A cartridge for unexposed sensitized sheet material, said cartridge comprising:

a. front and rear panels having peripheral edges;

b. four walls interconnecting said peripheral edges of said panels and forming a cavity therewith, one of said walls comprising a first door hingably mounted to said front panel and openable to permit insertion of a supply of sheet material into said cavity;

c. a second door in said front panel and openable to provide access to said cavity for removing the sheet material; and

d. means for establishing a lighttight seal about said first and second doors.

2. A cartridge as defined in claim 1 wherein said second door is mounted by hinge means to said front panel and carries a pin spaced from said hinge means and extending beyond one of said peripheral edges for opening said second door.

3. A mechanism for selectively raising any of a plurality of objects, said mechanism comprising:

a. a plurality of aligned carriers adapted to receive the objects;

b. a lifting device having a portion extending along said carriers and movable between raised and lowered positions normally independent of said carriers; and

c. means for selectively coupling individual ones of said carriers to said potion of the lifting device, whereby movement of said portion to its raised position effects movement of said individual ones of said carriers which are coupled to said lifting device.

4. A mechanism for selectively raising any of a plurality of objects, said mechanism comprising:

a. a plurality of carriers adapted to receive the objects;

b. a lifting device comprising:

1. a member extending below said carriers and having a portion movable in a substantially vertical direction towards and away from said carriers, and

2. means for raising and lowering said member; and

c. a latch associated with each of said carriers and movable between a first position in which said member portion is movable independently of the carrier associated with the latch and a second position in which the carrier associated with the latch is coupled to said member portion for vertical movement therewith.

5. A mechanism for selectively raising any of a plurality of objects, said mechanism comprising:

a. a plurality of substantially vertically disposed guide tracks;

b. a plurality of carriers for receiving the objects, said carriers having guide means associated with said tracks for confining said carriers to movement in a direction parallel to said tracks; and

c. means for raising only a selected one of said carriers.

6. A mechanism for positioning an object, said mechanism comprising:

a. a frame;

b. a plurality of parallel posts carried by said frame;

c. a carrier to receive the objects;

d. guide means carried by said carrier and cooperating with said posts to constrain said carrier to movement in a direction parallel to said posts;

e. roller means carried by said carrier for limiting frictional contact between said posts and said guide means;

f. a device having a portion movable generally in said direction; and

g. means for selectively connecting said carrier to said portion for causing said carrier to move therewith.

7. A mechanism for selectively raising any of a plurality of objects, said mechanism comprising:

a. a plurality of substantially vertically disposed guide tracks;

b. a plurality of carriers for receiving the objects, said carriers having guide means for cooperating with said tracks to confine said carriers to movement in a direction parallel to said tracks;

c. a lifting device having a portion movable between raised and lowered positions normally independent of said carriers; and

d. means for selectively coupling individual ones of said carriers to said lifting device portion, whereby movement of said lifting device portion to its raised position effects movement of said individual ones of said carriers which are coupled to said lifting device.

8. A mechanism for selectively raising any of a plurality of cartridges containing X-ray film and having a door openable to provide access to the sheet material, said mechanism comprising:

a. a plurality of carriers into each of which one of the cartridges may be inserted, each of said carriers having a raised position and a lowered position;

b. a lifting device having a portion movable between raised and lowered positions;

c. means cooperating with said lifting device portion for moving selected carriers between their raised and lowered positions; and

d. means responsive to movement of a carrier from its lowered to its raised position for opening the cartridge door.

9. A magazine for sheet material, said magazine comprising:

a. at least one cartridge adapted to receive the sheet material, said cartridge having a raised and a lowered position;

b. a door in said cartridge;

c. means for moving said cartridge between said lowered and raised positions; and

d. means responsive to movement of said cartridge from its lowered to its raised position for opening said door.

10. A magazine comprising:

a. a fixed frame;

b. at least one cartridge carried by said frame for movement in first and second opposite directions, said cartridge having:

1. a front wall which defines a plane, said directions of cartridge movement being parallel to said plane;

2. a plurality of other walls which, together with said front wall, define a cavity;

3. a door in said front wall to provide access to said cavity and movable in a direction away from said cavity about an axis of rotation perpendicular to said directions of cartridge movement to an open position; and

c. means engageable with said door upon movement of said cartridge in said first direction to move said door to its open position.

11. A magazine comprising:

a. a fixed frame;

b. at least one cartridge carried by said frame for movement in first and second opposite directions, said cartridge having:

1. a front wall which defines a plane, said directions of cartridge movement being parallel to said plane,

2. a plurality of other walls which, together with said front wall, define a cavity; and

3. a door in said front wall to provide access to said cavity and movable in a direction from said cavity about an axis of rotation perpendicular to said directions of cartridge movement to an open position; and

c. an arm pivotally connected to said frame at a point spaced from said plane and extending towards said plane, said arm having means to engage and open said door as said cartridge is moved in said first direction.

12. A magazine comprising:

a. a fixed frame;

b. at least one cartridge carried by said frame for movement in first and second opposite directions, said cartridge having:

1. a front wall which defines a plane, said directions of cartridge movement being parallel to said plane;

2. a plurality of other walls which, together with said front wall, define a cavity; and

3. a door in said front wall to provide access to said cavity and movable in a direction away from said cavity about an axis of rotation perpendicular to said directions of cartridge movement to an open position; and

c. a cam member mounted on said frame and engageable with said door as said cartridge is moved in said first direction to pivot said door to its open position and to pivot said door to a closed position as said cartridge is moved in said second direction.

13. A magazine as defined in claim 12 wherein said cam member includes signal means responsive to failure of said door to close completely as said cartridge is moved in said second direction.