Aug. 28, 1962 H. CARLIN ET AL 3,051,480

BUSINESS MACHINES

Filed Sept. 25, 1959 5 Sheets-Sheet 1

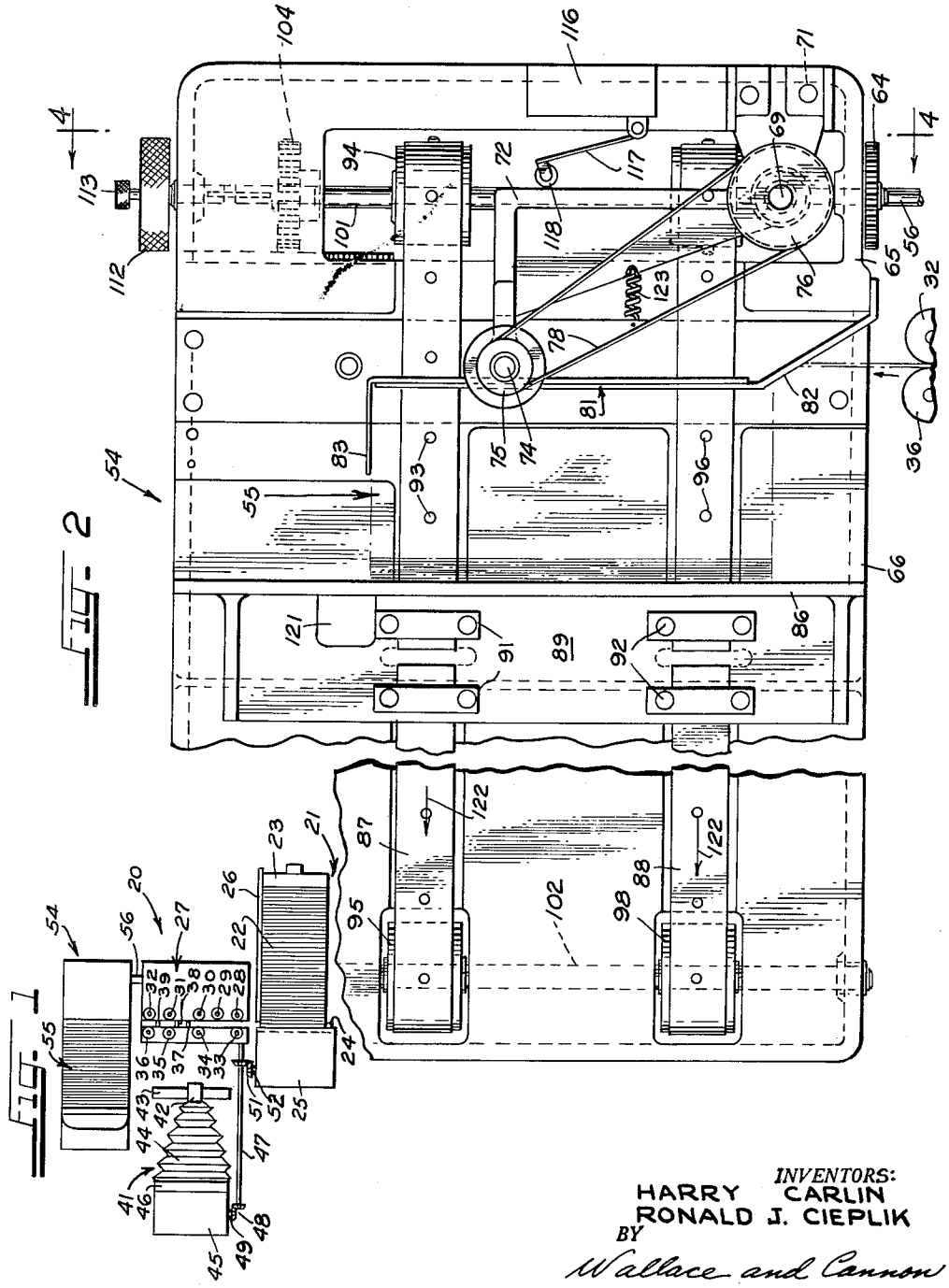


FIG. 2

FIG. 1

INVENTORS:
HARRY CARLIN
RONALD J. CIEPLIK
BY
Wallace and Cannon
ATTYS.

Aug. 28, 1962 H. CARLIN ET AL 3,051,480

BUSINESS MACHINES

Filed Sept. 25, 1959 5 Sheets-Sheet 2

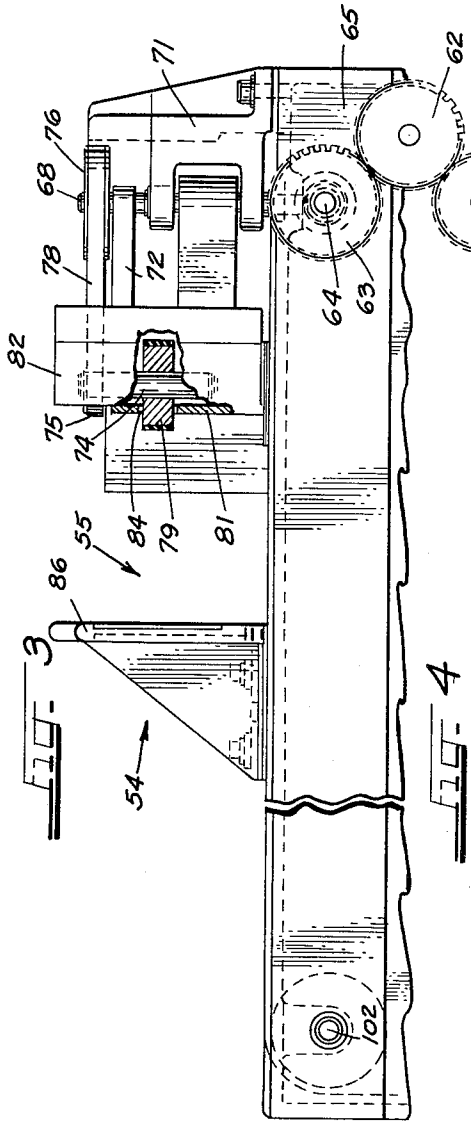


FIG. 3

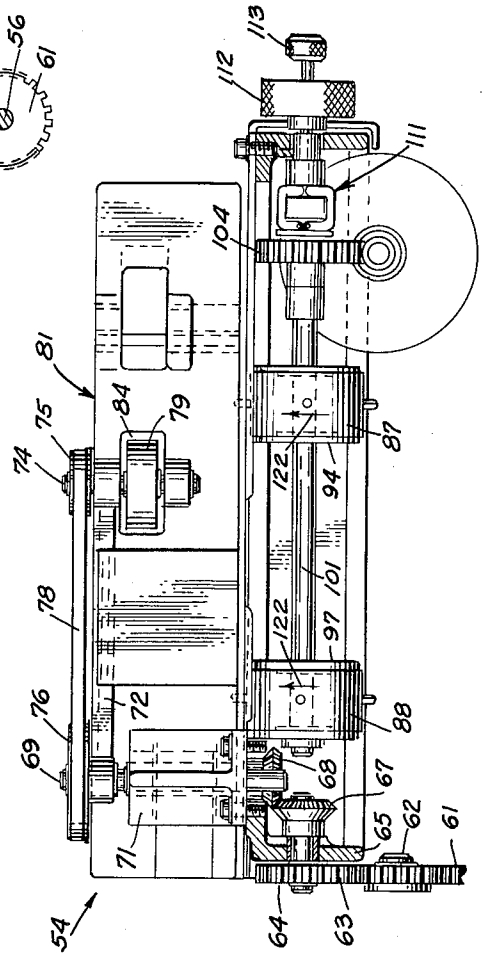


FIG. 4

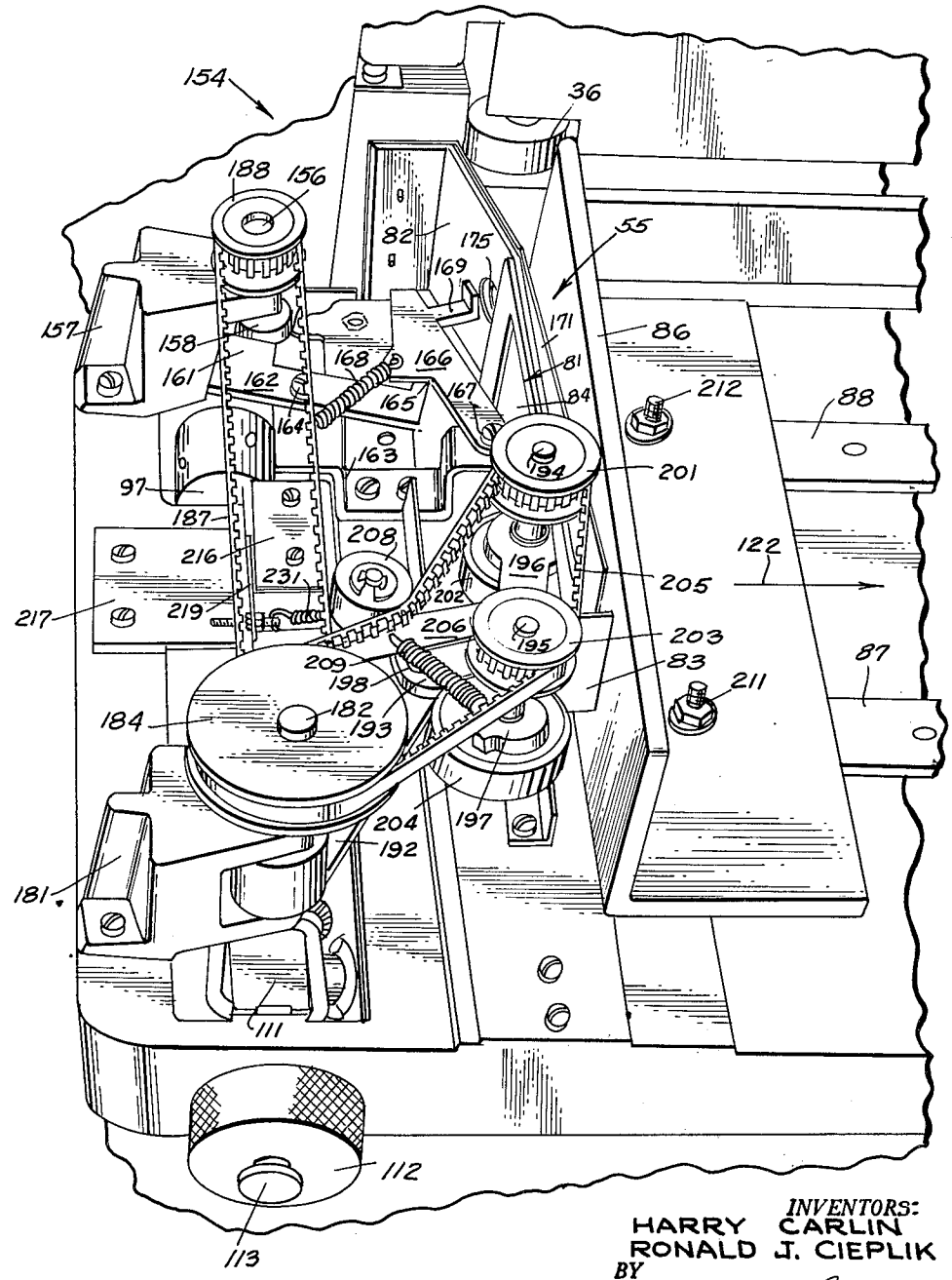
INVENTORS:
HARRY CARLIN
RONALD J. CIEPLIK
BY
Wallace and Cannon
Atty's.

Aug. 28, 1962 H. CARLIN ET AL 3,051,480

BUSINESS MACHINES

Filed Sept. 25, 1959 5 Sheets-Sheet 3

FIG. 5



INVENTORS:
HARRY CARLIN
RONALD J. CIEPLIK
BY
Wallace and Cannon
ATTYS.

Aug. 28, 1962 H. CARLIN ET AL 3,051,480

BUSINESS MACHINES

Filed Sept. 25, 1959 5 Sheets-Sheet 4

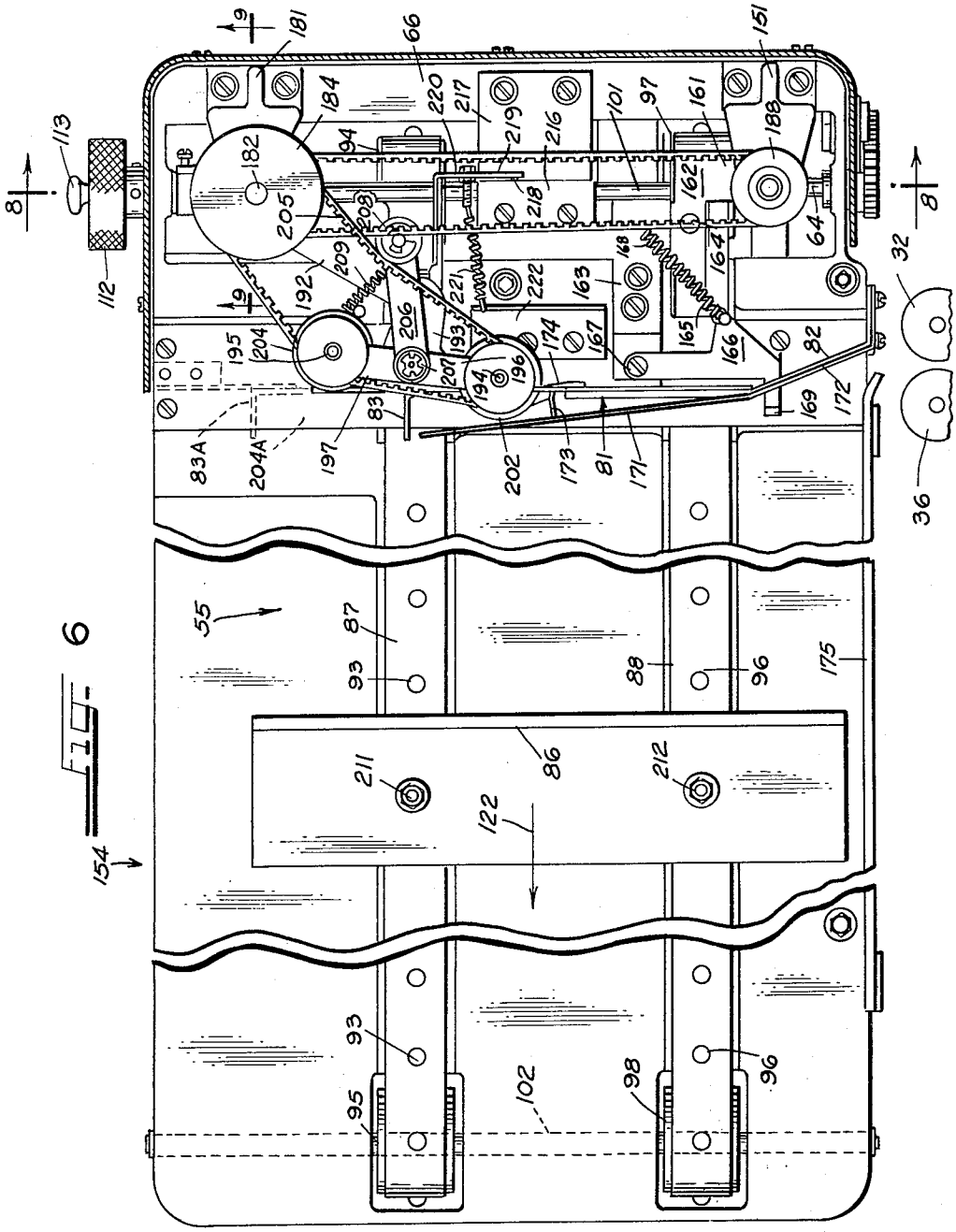


FIG. 6

INVENTORS:
HARRY CARLIN
RONALD J. CIEPLIK
BY
Wallace and Cannon
ATTYS.

Aug. 28, 1962 H. CARLIN ET AL 3,051,480

BUSINESS MACHINES

Filed Sept. 25, 1959 5 Sheets-Sheet 5

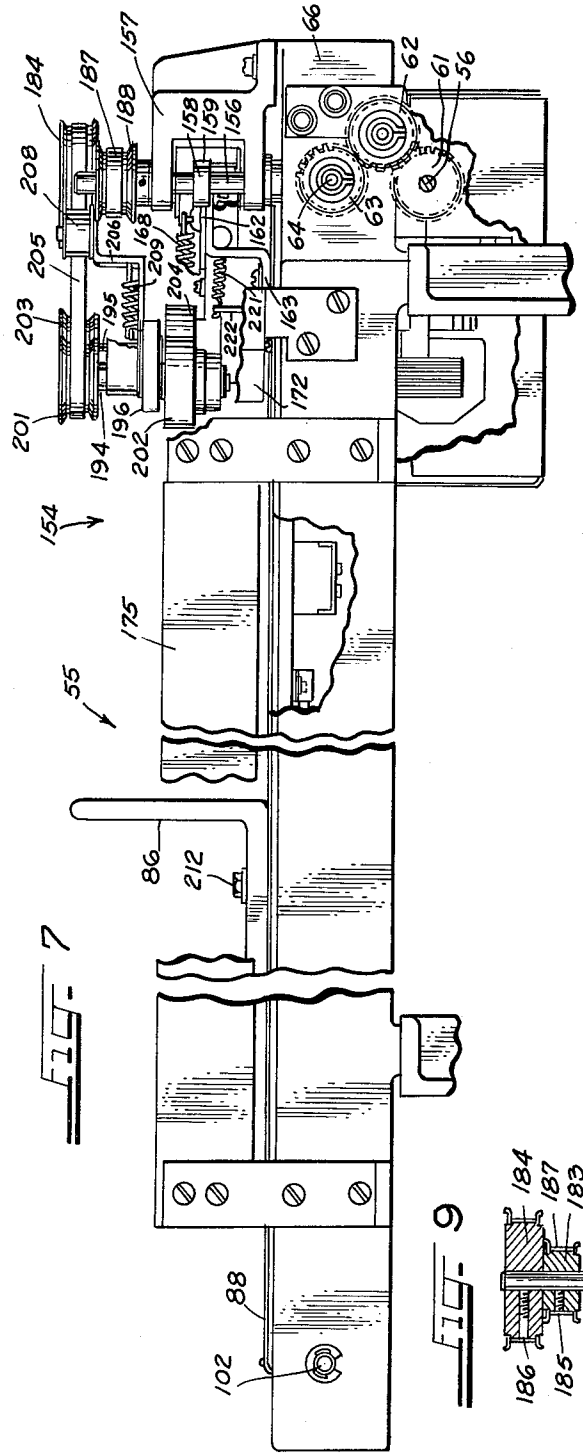


FIG. 7

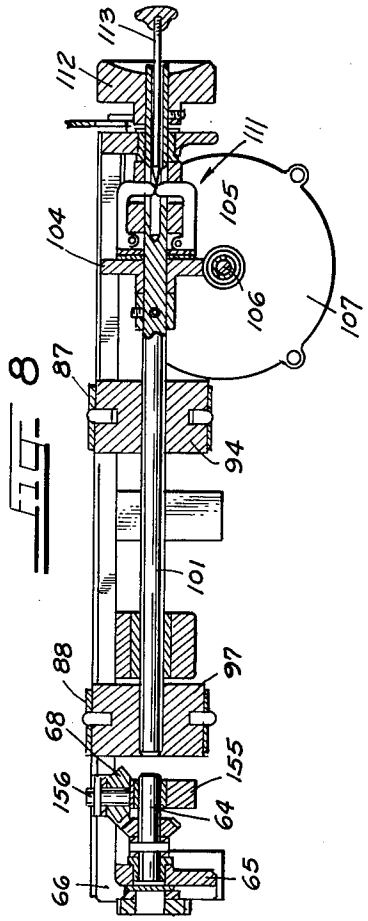


FIG. 8

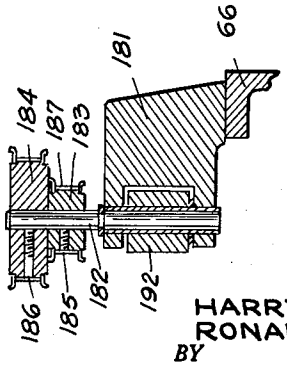


FIG. 9

INVENTORS:
HARRY CARLIN
RONALD J. CIEPLIK
BY
Wallace and Cannon
ATTYS.

United States Patent Office 3,051,480 Patented Aug. 28, 1962

3,051,480

BUSINESS MACHINES

Harry Carlin, Inwood, N.Y., and Ronald J. Cieplik, Elizabeth, N.J., assignors to Vari-Typer Corporation, Newark, N.J., a corporation of Delaware

Filed Sept. 25, 1959, Ser. No. 842,383
9 Claims. (Cl. 271—87)

This invention relates to card-controlled business machines and particularly to a new and improved high-speed, high-volume stacking device for the card-receiving station in a machine of this kind. Although the card stacker of the invention is also useful in connection with other high-speed, high-volume machines utilizing tabulating cards, it is particularly advantageous in a high-speed card-controlled photocomposing machine and, accordingly, is described in that connection.

High speed photocomposing machines, in which individual items are reproduced photographically from data upon conventional record cards or other similar business instruments, have been found to be highly advantageous in a number of applications. For example, machines of this kind may be utilized in preparing parts lists, directories, and like matter, and are especially advantageous in those instances where it may be desirable to change or to revise the content of the printed matter at relatively frequent intervals. In the composing operation, the record cards are fed individually to an exposure station at which they are accurately located with respect to the lens system of a camera. The printed data carried by the cards is photographed, sequentially, upon a strip of film which is fed through the camera synchronously with the feeding of cards to and through the exposure station of the machine. Photocomposing machines of this general type are described and claimed in the co-pending application of Edward H. Billet, Serial No. 776,662, filed November 21, 1958 and in the co-pending application of Edward H. Billet and Bently Raak, Serial No. 776,663, filed November 21, 1958.

For maximum versatility, photocomposing machines of this kind should be capable of handling record cards of different sizes, such as conventional seven and three-eighths inch and ten inch cards. The machines should be adapted to work with record cards or similar business instruments which are provided with tabs, particularly in those instances where relatively short items are to be composed in the machine, as in the case of individual parts lists. In order for the photocomposing machines to be competitive with other more conventional apparatus for composing data, they must be capable of relatively high speed operation. Actually, the necessity for high-speed operation imposes two distinct requirements on the machines. Thus, the photocomposing machines must be capable of moving the data cards at relatively high speeds and must also be capable of handling a relatively large number of cards in a given time interval. These requirements for high-speed operation apply not only to the basic feeding mechanism which moves the record cards into and out of the exposure station of the machine, but also to the receiving or stacking apparatus into which the cards are discharged after they have been utilized in the photocomposing operation. Of course, the card stacking or receiving apparatus must be capable of operation at the same speed as the card feed mechanism and should stack the cards in the same order in which they were placed in the photocomposing machine prior to use.

Another important requirement imposed by high speed operation of photocomposing machines and similar devices relates to the capacity of the card stacking or receiving apparatus. Obviously, little is gained by the use of a very high-speed machine if operation of the machine must

be frequently interrupted to remove cards from the card stacker in order to clear it for the reception of additional cards. Previously known card stacking devices have, in general, been limited to a capacity of 500 cards or less, and stacking devices of this kind severely limit the speed of operation of the photocomposing system itself. Another requirement in photocomposing machines of this kind, and particularly in the card receiving or stacking apparatus of the machines, is that the cards must be compactly and evenly stacked, in the card receiver, in order that they may be directly transferred from the card receiver to a storage area for future use.

It is a primary object of the invention, therefore, to provide a new and improved card stacker or receiver for a photocomposing machine or like device which affords a total storage capacity substantially larger than previously known devices.

A more specific object of the invention is to increase the capacity of a card receiver for a high speed photocomposing machine or similar apparatus to accommodate at least 3000 conventional record cards.

Another object of the invention is to incorporate, in a high speed, high capacity card stacking device for a photocomposing machine or the like, a means for enlarging the effective stacking area while at the same time maintaining the cards in a compact stack.

An additional object of the invention is to provide a high speed, high capacity stacker for a photocomposing machine or the like which is effective to stack the cards in vertical alignment with each other, in the same order in which they were fed to the photocomposing machine, and to operate the card stacker mechanism in synchronism with the operation of the photocomposing machine.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what are now considered to be the best modes for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a schematic diagram of a photocomposing machine of the kind in which the card stacker of the present invention may be incorporated;

FIG. 2 is a plan view of a card stacker or card receiving apparatus constructed in accordance with one embodiment of the invention;

FIG. 3 is an elevation view of the card stacking apparatus of FIG. 2;

FIG. 4 is a sectional view of the card stacker of FIG. 2, taken approximately along line 4—4 therein;

FIG. 5 is a perspective view of a card stacker or card receiving apparatus constructed in accordance with a preferred embodiment of the invention;

FIG. 6 is a plan view of the card stacker shown in FIG. 5;

FIG. 7 is an elevation view, partly cut away, of the card stacker illustrated in FIG. 6;

FIG. 8 is a detail sectional view taken approximately along line 8—8 in FIG. 6; and

FIG. 9 is a detail sectional view of a part of the drive apparatus for the card stacker of FIGS. 5–8, taken approximately along line 9–9 in FIG. 6.

FIG. 1 illustrates, in substantially schematic form, a photocomposing machine 20 in which the card stacking apparatus of the present invention may be incorporated. The photocomposing machine 20 includes a card storage magazine 21 in which individual record cards bearing

data to be utilized in the photocomposing process are first stacked. The record cards 22 are stored in the magazine 21 in vertical alignment; that is, the cards are stacked on edge and are disposed between a back-up plate 23 and the face plate 24 of a card feeder mechanism 25. A suitable guide rail 26 or other device may be utilized to maintain the ends of the record cards 22 in alignment with each other.

The exposure station 27 of the photocomposing machine 20 is disposed immediately adjacent the card feeder 25 and is aligned therewith. Exposure station 27 may include a plurality of drive rollers 28, 29, 30, 31 and 32 and suitable idler rollers 33, 34, 35 and 36 which are aligned, in the illustrated arrangement, with the drive rollers 28, 30, 31 and 32, respectively. The exposure station 27 may further include a pair of retractable locating pins 37 and 38 and a retractable card stop member 39, members 37—39 being employed to position individual record cards in the exposure station 27 as described more fully hereinafter.

A camera 41 is included in the photocomposing machine 20 and is aligned with the exposure station 27. The camera 41 may include a lens system 42 mounted upon a mounting plate 43. Preferably, the mounting plate is movable toward and away from the exposure station 27 to afford a means for conveniently adjusting the size of the data reproduced by the photocomposing machine. The lens system 42 may be conneced by a bellows or other suitable means 44 to a film box 45. A shutter 46 may be interposed between the film box 45 and the lens 42. Within the film box 45 there is located a film-advancing mechanism which operates to move a photographic film in synchronism with movement of record cards into and out of the exposure station 27. Operation of the exposure station may be synchronized with operation of the card feeder 25 and the film-advancing mechanism of the camera 41 by employing a single drive apparatus for all of these devices. Such a drive arrangement is illustrated schematically in FIG. 1, and includes a main drive shaft 47 connected by gears 48 to a drive shaft 49 for the film-advancing mechanism of the camera 41. A second set of gears 51 connects the shaft 47 to a drive shaft 52 which forms a part of the card feeder 25.

The photocomposing machine 20 may further include a card stacker or card receiving apparatus 54 which receives the cards from the exposure station 27 and stacks them in an orderly array in a card storage magazine generally indicated by the reference numeral 55. The card stacker 54 is preferably driven mechanically from the exposure station 27, as generally indicated by a shaft 56 which connects the exposure station to the card stacker.

The photocomposing machine 20 is substantially similar in construction and operation to that described in the aforementioned application of Billet, Serial No. 776,662, and may be essentially the same as that described and claimed in the co-pending application of Davidson, Serial No. 806,719, filed April 19, 1959. Accordingly, only a brief description of the operation of the photocomposing machine 20 is required.

When the photocomposing machine 20 is placed in operation, a substantial quantity of record cards or similar business instruments are stacked in the magazine 21. When the machine is started, the card feeder 25 operates to feed the lead card from th stack 22 past the forward end of the guide rail 26 and into the exposure station 27. The card is driven forward into the exposure station by the rolls 28 and 33, and continued movement of the card is effected by the rolls 30 and 34. The roll 31 is a kick-out roll and does not engage the record card as it is fed into the exposure station. Movement of the card into the station 27 is interrupted by engagement with the retractable stop member 39, which establishes the card in approximate exposure position.

With the record card thus located approximately in position for exposure, the locating pins 37 and 38 are advanced through locating apertures in the card and are effective to position the card in accurate alignment with the camera 41. The data on the card is photographed by the camera, after which the stop member 39 is retracted and the kick-out roller 31 is advanced into engagement with the card. The kick-out roll 31 cooperates with the idler roller 35 to advance the card into the bight of the rollers 32 and 36, which are effective to transfer the card from the exposure station 27 to the card stacker 54. As the first card is removed from the exposure station, the next subsequent card from the stack of cards 22 is fed into the exposure station. Furthermore, during each card photographing cycle, the film-advancing mechanism in the film box 45 is operated to advance the film a predetermined distance and thus condition the camera for a further photographing operation. The sequence of operations set forth above is repeated as many times as is necessary to photograph the cards in the stack 22 in composing the desired parts list, directory, or other matter. When the photocomposing operation is completed, all of the cards are located in the magazine 55 of the card stacker 54. It should be understood that numerous details of operation of the photocomposing mechanism per se have been omitted in this description, since they do not relate to construction or operation of the present invention. Thus, a mechanism may be provided for interrupting operation of the photocomposing machine, and this mechanism may be controlled by special punched cards incorporated in the card stack 22 and used conjointly with a sensing device incorporated in the exposure station 27. As described in the aforementioned Davidson application, the roller 34 may be transferred from alignment with the roll 30 and into alignment with the roll 29 in order to accommodate larger cards.

The card stacker 54, which comprises one embodiment of the present invention, is shown in detail in FIGS. 2–4. As illustrated therein, the card stacker is driven from the shaft 56, this shaft being one which is driven through one complete revolution during each cycle of operation of the photocomposing machine. The drive mechanism for the card stacker includes a gear train comprising the gears 61, 62 and 63 (see FIG. 3). The initial drive gear in the train, the gear 61, is affixed to the shaft 56 for rotation therewith. In the illustrated embodiment, the gears 61 and 63 are approximately equal in size so that the overall drive ratio for the gear train is approximately 1:1.

The spur gear 63 is affixed to a relatively short shaft 64 which is journalled in a suitable bearing in the side wall 65 of the base 66 of the card stacker. A bevel gear 67 (FIG. 4) is mounted upon the end of the shaft 64 opposite the spur gear 63 and is disposed in meshing engagement with a second bevel gear 68 which is mounted upon a vertical shaft 69. The shaft 69 is supported by and is journalled in suitable bearings in a support bracket 71 which is mounted upon the upper portion of the base 66 of the card stacker.

A substantially L-shaped support arm 72 is pivotally mounted upon the shaft 69, the configuration of the support arm 72 being best illustrated in FIG. 2. At the end of the support arm opposite the shaft 69, a second vertical shaft 74 is mounted in suitable bearings in the support arm. A pulley 75 is mounted upon the upper end of the shaft 74 in alignment with a drive pulley 76 that is mounted upon the upper end of the shaft 69, being affixed to the shaft 69 for rotation therewith. A timing belt 78 or other suitable drive belt extends between and engages the two pulleys 75 and 76. A card feed roll 79 is also mounted on the shaft 74 for rotation therewith, and it is this roll which provides for the final movement of the individual record cards to a stacking position as described more fully hereinafter.

The card stacker 54 also includes a stationary guide 81

which extends across the base **66** of the card stacker, the configuration of the guide **81** being best illustrated in FIG. 2. As shown therein, the guide includes an initial angled guide portion **82** which is disposed closely adjacent the feed rolls **32** and **36** which eject the individual record cards from the exposure station **27** of the photocomposing machine **20** (FIG. 1). The center portion of the guide **81** extends substantially parallel to the original direction of movement of the cards as they are ejected from the exposure station, but the opposite end of the guide **81** comprises a stop portion **83** which interrupts movement of the cards as they are fed into the stacker. As indicated in FIGS. 3 and 4, the central portion of the guide member **81** is provided with an aperture **84** through which the feed roll **79** projects.

The stacker **54** further includes a backup member **86** against which the cards are positioned in the final stacking operation. That is, the stacker **54** stacks the cards in the magazine **55** between the backup member **86** and the guide **81** as generally illustrated by the phantom outline of a stack of cards (FIG. 2). The backup member **86** is mounted upon a pair of horizontal support members such as the tapes **87** and **88**. Each of the tapes **87** and **88** is threaded through suitable openings in the base portion **89** of the backup member **86**, and is secured thereto by suitable clamping means such as the clamps **91** and **92**. Accordingly, the backup member **86** may be moved to the left or right, as seen in either of FIGS. 2 or 3, by movement of the tapes **87** and **88**. The tapes **87** and **88** may be fabricated from any relatively strong fabric which does not deteriorate if used over a relatively long period of time; woven nylon tape has been found quite suitable for this purpose. On the other hand, metal bands or other horizontal support member arrangements may be employed if desired.

The tape **87** is provided with a plurality of spaced apertures **93** and is engaged by a drive sprocket **94** and an idler sprocket **95**. Similarly, the tape **88** has a plurality of openings or apertures **96** therein, and the tape is engaged by a drive sprocket **97** and an idler sprocket **98**. The two drive sprockets **94** and **97** are mounted upon a backup drive shaft **101** for rotation therewith (see FIGS. 2 and 4), whereas the two idler sprockets **95** and **98** are mounted upon a suitable shaft **102** (FIG. 2). The drive for the shaft **101** comprises a worm gear **104** which is mounted upon the shaft **101** in driving relation therewith. The gear **104**, in turn, is engaged by a gear **105** which is secured to the drive shaft **106** of a stacker drive motor **107**.

Means are also provided for driving the shaft **101** manually. Thus, a simple clutch device **111** is mounted on the backup shaft adjacent the worm gear **104**. The clutch **111** is connected to a manual drive knob **112** and is actuated by a plunger **113** which extends axially of the knob **112**. With the plunger **113** in the extended position shown in FIG. 4, the clutch **111** is disengaged, and this is the normal operating condition of the clutch. On the other hand, the plunger **113** may be moved to the left, as seen in FIG. 4, to engage the clutch **111** and connect the knob **112** in driving relation to the backup shaft **101**. Inasmuch as the manually operated clutch **111** is substantially conventional in construction and does not comprise a critical part of the present invention, the clutch construction is not described in detail herein.

The stacker **54** further includes a control arrangement for actuating the backup drive motor **107**. This control arrangement includes a control switch **116** (FIG. 2) having a sensing arm **117** pivotally connected to the switch mechanism. The arm **117** supports a roller **118** which engages the support arm **72** and is utilized to control operation of the switch **116** in accordance with the position of the support arm **72** as described more fully hereinafter.

In describing the operation of the stacker **54**, it may be assumed that there are no cards present in the stacker, at the beginning of the operation. This being the case, the backup member **86** is originally moved to a position closely adjacent the guide member **81**. In this regard, it should be noted that the stop portion **83** of the guide member **81** may fit into a slot or open portion **121** in the backup member, so that the backup member may be spaced from the stationary guide by a distance equal to the thickness of only a few cards. Under these conditions, when the photocomposing machine is placed in operation, the first card ejected from between the rollers **32** and **36** is deflected by the angle portion **82** of the guide **81** into the space between the members **81** and **86**. As the card moves into this space, it is eventually engaged by the roller **79**, which impels the card further into the stacker until its forward movement is interrupted by the stop member **83**.

The next card is treated in essentially the same manner, being guided into the stacker between the first card and the stationary guide member **81**. This action continues uninterruptedly, building up a stack of cards between the guide member **81** and the backup member **86**, the cards being stacked in the same order as that in which they are fed through the photocomposing machine.

As the card stack grows, the space between the backup member **86** and the fixed guide member **81** is filled. Consequently, the cards begin to exert pressure upon the stacker feed roll **79**, urging the feed roll to the right as seen in FIG. 2, and tending to pivot the support member **72** in a clockwise direction about the shaft **69**. It will be understood, of course, that the shaft **69** is driven through a full revolution during each operating cycle of the photocomposing machine **20**, by virtue of its drive connection to the shaft **56** (FIG. 1). However, the drive system for the stacker roll **79** is constructed to rotate the stacker roll at a speed somewhat slower than the feed rolls in the exposure station **27** in order to slow the cards down before they hit the stop member **83**, reducing the possibility of damage to the cards.

When the support member **72** is pivoted in a clockwise direction, as noted hereinabove, due to the buildup of cards in the stacker, the roller **118** and the switch sensing arm **117** are also moved to the right as seen in FIG. 2. When the sensing arm has moved through a predetermined distance, preferably equal to the thickness of a relatively small number of cards, the normally open control switch **116** is closed. The closing of this switch energizes the motor **107**. Accordingly, the backup drive shaft **101** is started in rotation through the drive connection, comprising the gears **104** and **105**, between the shaft and the motor **107**. Rotation of the shaft **101** moves the two tapes **87** and **88** in the direction indicated in the drawings by the arrows **122**. This movement of the two tapes causes the backup member **86** to move in the direction of the arrows **122** and away from the fixed guide member **81**.

Of course, as the backup member moves away from the fixed guide member, the pressure applied to the drive roll **79** is reduced. In addition, a biasing spring **123** tends to pivot the support arm **72** in a counterclockwise direction, urging the support arm and the drive roll **79** back toward their original positions. Accordingly, the support arm **72** pivots back to its original operating position, this movement is followed by the sensing arm **117**, and the switch **116** is opened. Operation of the stacker proceeds as described hereinabove until the thickness of the stack again forces the drive roll **79** and the support arm **72** to a position in which the sensing arm **117** closes the switch **116**. When this occurs, the backup drive arrangement again operates as described hereinabove to move the backup member **86** farther away from the fixed guide **81** and thus provide room for more cards in the stacker.

At the end of a given run of the photocomposing machine **20**, it may be desirable to remove the cards from the magazine **55** and start a new run of the machine with no cards in the stacker. To this end, it is only necessary to lift the cards from the stacker, after which the plunger **113** may be employed to disengage the clutch **111** and

the knob 112 may be utilized manually to return the backup member 86 to its original position as described hereinabove.

In FIG. 2, the guide member 81 is arranged for use with relatively small cards such as conventional 7⅜ inch cards. However, the guide member is of telescoping construction, such that the stop member 83 may be moved to the edge of the stacker, away from the drive roll 79, to accommodate larger cards. This is the only change in the stacker which is necessary to accommodate a change in card size.

FIGS. 5–9 illustrate a card stacker 154 which is substantially similar to the card stacker 54 described hereinabove but which includes certain improvements and additional operating devices not incorporated in the first-described embodiment. In those instances where individual component parts of the card stacker 154 may be essentially the same as in the stacker 54 described heretofore, corresponding reference numerals are employed. In comparing the two embodiments of the invention, it should be noted that FIG. 6 corresponds substantially to FIG. 2, FIG. 7 is substantially similar to FIG. 3, and FIG. 8 is in many respects substantially similar to FIG. 4.

As in the case of the previously described embodiment, the card stacker 154 of FIGS. 5–9 is driven by the shaft 56 which also comprises an operating shaft for the exposure station of the photocomposing machine. As shown in FIG. 7, the drive arrangement may comprise the gears 61, 62 and 63, the initial drive gear 61 being affixed to the shaft 56 for rotation therewith. As in the previously described embodiment, the gear sizes are preferably selected to afford an overall drive ratio for the gear train 61—63 of approximately 1:1. As before, the gear 63 is secured to a relatively short shaft 64 which is journalled in a suitable bearing in the side wall 65 of the base 66 of the card stacker. As shown in FIG. 8, a bevelled gear 67 is mounted upon the shaft 64 in meshing engagement with a second bevelled gear 68. In this instance, a separate outboard support and bearing member 155 is provided for the shaft 64. The driven bevelled gear 68 is mounted upon a vertical shaft 156 which is supported by and journalled in suitable bearings in a support bracket 157 (see FIGS. 7 and 8). The bracket 157, in turn, is mounted in the upper portion of the base 66 of the card stacker.

An eccentric 158 is mounted upon the shaft 156 for rotation therewith, and may be secured to the shaft by suitable adjustable means such as the set screw 159 (see FIG. 7). The eccentric 158 is engaged by a cam follower portion 161 of a cam follower lever 162, the lever 162 being pivotally mounted upon a bracket 163 as indicated by the reference numeral 164 (see FIGS. 5 and 6). The opposite end 165 of the lever 162 engages a pusher arm 166 that is pivotally mounted upon the bracket 163 as indicated by the reference numeral 167. A spring 168 is connected to the pusher arm 166 and urges the pusher arm toward rotation in a counterclockwise direction, as seen in FIGS. 5 and 6. In operation of the machine, the pusher arm 166 is movable between an initial or unactuated position, illustrated in FIG. 5, and an actuated position as shown in FIG. 6 in which the pusher arm is displaced in a clockwise direction with respect to the initial position, the operation of the pusher arm being described in detail hereinafter. The construction of the pusher arm 166 also includes a card pusher element 169 which projects outwardly of the pusher arm and which is utilized in maintaining the record cards in compact stored relationship in the card stacker, and described in detail hereinafter.

The card stacker 154, like the previously described stacker 54, includes stationary guide or card stop assembly 81 which extends across the base 66 of the card stacker, as best shown in FIGS. 5 and 6, and comprises the front wall of the card storage magazine 55. The guide assembly 81 includes the initial angled guide portion 82 disposed adjacent the feed rolls 32 and 36 at the output end of the exposure station of the photocomposing machine. As before, the central portion of the guide assembly 81 extends substantially parallel to the original direction of movement of the cards, and terminates in a stop portion 83 which interrupts movement of the cards as they are fed into the stacker. As before, the central portion of the guide member 81 is adjustable in length and is provided with an aperture 84 (see FIG. 5) through which a feed roll may be projected.

In the stacker 154, however, an additional stationary guide member is provided. This additional guide structure comprises the relatively thin lightweight baffle 171 which includes an initial guide portion 172 that constitutes a facing for the guide portion 82 of the assembly 81. The major portion of the baffle 171, however, projects outwardly of the assembly 81 at a relatively small angle. A retainer element 173 affixed to the baffle member 171 projects through the central aperture in the guide structure 81 and constitutes a means for limiting the spacing between the baffle 171 and the guide structure 81, being provided with a foot 174 which projects around and engages the edge of the aperture 84 in the guide assembly 81 (see FIGS. 5 and 6). An aperture 175 is provided in the initial guide portion 82 of the guide assembly 81, and a corresponding aperture is formed in the section 172 of the baffle. The aperture 175 is aligned with the card pusher element 169 on the pusher 166 to permit the element 169 to project through the guide assembly into contact with the record cards being stored in the stacker.

A bracket member 181, which is substantially similar to the bracket member 157, is mounted upon the base 66 of the card stacker 154 at the side of the machine opposite the bracket 157. As is clearly shown in the detail view of FIG. 9, a vertical shaft 182 is journalled in suitable bearings in the bracket 181. On the shaft 182 there are mounted a pair of pulleys 183 and 184, the pulley 183 being substantially smaller than the pulley 184 and being located below the pulley 184 on the shaft 182. The pulleys 183 and 184 are secured to the shaft 182 for rotation therewith by suitable means such as the set screws 185 and 186, respectively. The pulley 183 is engaged by a drive belt 187 which extends across the stacker, as shown in FIGS. 5 and 6, and which engages a pulley 188 that is mounted upon the shaft 156 and secured thereto for rotation with the shaft. Preferably, the belt 187 is of the kind conventionally referred to as a timing belt or a gear belt, although a chain drive or other drive arrangement can be utilized, if desired.

A support arm 192, which is substantially similar to the support arm 72 of the first-described embodiment, is pivotally mounted upon the shaft 182, as best shown in FIGS. 5 and 9. A substantially T-shaped feed roll support bracket 193 is adjustably affixed to the support arm 192, and a pair of vertical shafts 194 and 195 are mounted in suitable bearings in the two arms 196 and 197, respectively, of the bracket 193. The bracket 193 is pivoted upon the mounting shaft 207 but is held in adjustable fixed position by a retainer screw engaged in the elongated slot 198.

A pulley 201 is affixed to the shaft 194 for rotation therewith, being located adjacent the top of the shaft as shown in FIG. 5. On the lower end of the shaft 194, beneath the bracket arm 196, a feed roll 202 is affixed to the shaft for rotation therewith. Similarly, a pulley 203 is affixed to the top of the shaft 195, and a feed roll 204 is secured to the lower end of the shaft 195. The three pulleys 184, 201 and 203 are all engaged by a drive belt 205, the belt 205 preferably being a timing belt or gear belt similar in construction to the belt 187. A tensioning arrangement is provided for the belt 205, and comprises a support lever 206 which is pivotally mounted upon the T-shaped bracket 193, as indicated by the reference numeral 207 in FIG. 6. A take-up roller 208 is rotatably mounted on the end of the support member 206 opposite the pivotal mounting 207 in position to engage the timing

belt 205. A spring 209 connected to the lever 206 biases the lever toward counterclockwise movement, as seen in FIG. 6, maintaining the take-up roller 208 in engagement with belt 205 and thus maintaining the belt under tension at all times.

The card storage magazine 55, in the stacker 154, is similar in construction to that described hereinabove in connection with the stacker 54. Thus, the stacker includes a back-up member 86, which comprises an adjustable support member and against which the cards are positioned in the stacking operation. As before, the back-up member 86 is mounted upon a pair of flexible horizontal support members comprising the tapes 87 and 88 by suitable means as generally indicated by the screws 211 and 212 (see FIG. 6). Preferably, the members 87 and 88 are fabricated from a relatively strong fabric, such as nylon tape, which does not deteriorate with repeated use, although metal bands or other tape members may be employed if desired. The tape 87 is provided with a plurality of spaced sprocket-engaging apertures 98 and is engaged by the drive sprocket 94 and the idler sprocket 95. Similarly, the tape 88 is provided with a plurality of apertures 96 which are utilized to engage a drive sprocket 97 and an idler sprocket 98. The idler sprockets are best shown in FIG. 6, whereas the engagement of the tape with the two drive sprockets 94 and 97 is best shown in FIG. 8. As before, the two drive sprockets 94 and 97 are mounted upon the back-up drive shaft 101 for rotation therewith (see FIG. 8), whereas the idler sprockets may be mounted upon a suitable shaft 102 (FIG. 6).

The drive arrangement for the shaft 101 is substantially similar to that described hereinabove in connection with the stacker 54, and includes a worm gear 104 which is mounted upon the shaft 101 in driving relation with respect thereto. The gear 104 is engaged by a pinion 105 which is secured to the drive shaft 106 of the back-up drive motor 107. Means are also provided for manual operation of the back-up member 86 of the card storage magazine, and comprises a clutch 111 which is mounted upon the shaft 101 adjacent the worm gear 104. As before, the clutch 111 is connected to the manual drive knob 112 and is actuated by a plunger 113 extending axially of the manual drive knob. The plunger 113 is shown in its extended position, in which the clutch 111 is disengaged, this being the normal operating condition for the clutch.

The control arrangement for the back-up drive motor 107 is somewhat modified, in the stacker 154, as compared with the stacker 54. Thus, the control means for the back-up drive motor, in the stacker 154, includes a control switch 216 which is mounted upon a bracket 217 in the central portion of the stacker, as best shown in FIGS. 5 and 6. The control switch 216 is a normally closed switch which can be held open by the application of pressure to a switch actuator 218 (FIG. 6). The switch actuator 218 is engaged by an arm 219 on a bracket 220 which is affixed to the support arm 192. The arm 219 and the switch 216 comprise a sensing device which is effective to control the storage capacity of the card stacker 154, as described in detail hereinafter.

At the start of operation of the stacker 154, there may be no cards present in the storage magazine 55. If this is the case, the adjustable support member of back-up member 86 is moved to a position closely adjacent the guide structure 81, and may be moved forward into contact with the stop member 83 of the guide assembly, this position being illustrated in FIG. 5. This movement may be effected by pushing the plunger 113 inwardly to engage the clutch 111 and then using the manual drive knob 112 to rotate the shaft 101 and sprockets 94 and 97, moving the tapes 87 and 88 and the support member 86 toward the guide assembly 81.

When the photocomposing machine or other similar machine is placed in operation, the first card ejected by the rolls 32 and 36 is deflected by the angle portion 172 on the baffle 171 into the space between the baffle 171 and the adjustable support member 86. As the card moves into this space, it is engaged by the feeder roll 202, which continues the movement of the card into the stacker 154 until movement of the card is interrupted by engagement with the stop member 83. As before, each of the cards is treated in essentially the same manner, being guided into the stacker between the cards already present in the storage magazine 55 of the stacker and the baffle 171 of the stationary guide assembly 81. This action continues without substantial interruption, building up a stack of cards between the guide assembly 81 and the back-up member or vertical support member 86, the cards being stacked in the same order in which they were originally fed into the photocomposing machine.

As the stack of cards accumulates in the magazine 55, the space between the back-up member 86 and the guide assembly 81 is filled, bending the flexible baffle 171 back toward the fixed portion of the guide assembly. Consequently, the cards begin to exert pressure upon the stacker feed roll 202 and tend to pivot the support member 192 upon which the feed roll is supported in a counterclockwise direction about the shaft 182, as seen in FIG. 6. As in the previously described embodiment, the drive system for the stacker roll 202 is constructed to rotate the feed roll at a speed somewhat slower than the feed rolls 32 and 36 which eject the cards into the stacker, so that the cards are not damaged by engagement with the stop member 83.

As the support arm 192 pivots in a counterclockwise direction, the arm 219 of the bracket 220 moves with it. When the sensing arm 219 has been moved through a predetermined distance, the switch 216 closes, due to disengagement of the arm 219 from the switch actuator 218. The distance through which the arm 219 must move before the switch is closed is preferably made equal to the thickness of relatively small number of cards, but, of course, is independent of the thickness of individual cards. When the switch 216 closes, the motor 107 is energized and drives the shaft 101 through the gears 104 and 105. The resulting rotation of the shaft 101 moves the two tapes 87 and 88, and hence the back-up member 86, in the direction indicated in the drawing by the arrows 122. Accordingly, the storage capacity of the magazine portion 55 of the card stacker is increased to provide room for additional cards in the stacker. In this manner, the capacity of the storage magazine in the card stacker is adjusted in accordance with actual need and independently of the thickness of individual record cards.

As the adjustable support member 86 moves away from the guide assembly 81, the pressure exerted by the cards on the feed roll 202 is reduced. A biasing spring 221, which is connected to a fixed bracket 222 and to the sensing arm 219, urges the arm 219 and the support arm 192 toward rotation in a clockwise direction, and, accordingly, tends to pivot the support arm and the drive roll 202 back toward their original positions. As the support arm 192 moves back to its original operating position, the sensing arm 219 on the bracket 220 again engages the switch actuator 218 and opens the switch 216, shutting off the back-up drive motor 107. Thereafter, operation of the stacker 154 proceeds as described hereinabove until a further plurality of record cards of predetermined total thickness accumulates in the stacker and again forces the stacker feed roll 202 and support arm 192 to a position in which the sensing arm 219 is disengaged from the switch actuator 218, permitting the switch 216 to close. When this occurs, the back-up drive is again energized, as described hereinabove, moving the adjustable support member 86 a further distance from the guide assembly 81 to again adjust the capacity of the card stacker magazine to accommodate additional record cards.

As thus far described, the stacker 154 operates in a manner substantially similar to the previously described stacker 54. In addition, however, the stacker 154 oper-

ates to maintain the cards in the magazine **55** in compact assembly relative to each other, throughout the lengths of the cards. At the beginning of each cycle of operation, when a record card enters the space between the baffle **171** and the adjustable support member **86**, the pusher arm **166** and the drive arrangement for the pusher arm, comprising the lever **162** and the eccentric **158**, are in the position shown in FIG. 5, in which the pusher element **169** does not contact the record card and does not interfere with its movement into the magazine area **55** of the card stacker. As the card advances into the stacker, however, rotational movement of the eccentric **158** on the shaft **166** causes the lever **162** to pivot in a counterclockwise direction, as seen in FIG. 5, bringing the end portion **165** of the lever into engagement with the pusher arm **166**. Continued rotational movement of the lever **162** forces the pusher arm **166** to rotate about its pivot point **167** toward the position illustrated in FIG. 6 and against the bias afforded by the spring **155**. Consequently, as the record engages the stop **183**, and is interrupted in its movement into the stacker, it is also engaged by the pusher element **169** which forces the card toward the adjustable support member **86** and thus effectively compacts the cards stored in the magazine **55** of the card stacker. Accordingly, in every cycle of operation of the card stacker **154**, the cards are pushed together, forming a compact stack and enabling the stacker to accept a substantially larger number of cards than would otherwise be possible. The flexible baffle **171** is also of some assistance in this regard, since it tends to guide the leading edge of each card into engagement with the stack and assists the feed roll **202** in this respect. A fixed guide **175** may be provided at one side of the magazine **55** to prevent misalignment of the cards in this direction.

In FIGS. 5 and 6, the card stacker **154** is shown adjusted for use with conventional record cards having a length of seven and three-eighths inches. However, and like the stacker **54**, it may be adjusted to accommodate conventional ten inch cards. To effect this adjustment, the card stop **83** is relocated in the position indicated in FIG. 6 by the dash outline **83A** At the same time, the fixed guide portion of the guide assembly **81** is extended; it will be recalled that this is a telescoping structure. In addition, the connection between the feed roll mounting bracket **193** and the support arm **192** is released, and the bracket **193** is pivoted in a counterclockwise direction, as seen in FIG. 6, advancing the feed roll **204** to the position indicated by the dash outline **204A**. At the same time, of course, the feed roll **202** is retracted to a position in which it does not engage cards fed into the stacker. The bracket **193** is secured in this new position and the stacker is then ready for operation with ten inch cards. This adjustment is somewhat more complex than is necessary in the card stacker **54**, although only a couple of minutes is required to effect the change in the feed roll alignment. However, the use of the feed roll **204**, near the end of the ten inch cards, affords a more positive drive for the cards, in the end of their movement into the stacker, and provides positive protection against jamming of the stacker which might result if a card were not pulled completely into the stacker and into engagement with the stop **83**.

Because the cards, in each embodiment of the invention, are positively pulled into the stacker and are continuously urged toward the vertical support member **86** by the stacker feed roll, the cards are stacked compactly in the magazine **55**. Furthermore, the positive action of the stacker makes it possible to store a substantially greater number of cards therein than would otherwise be possible. This is particularly true with respect to the preferred embodiment, the stacker **154**, in which the resilient baffle **171** and the pusher mechanism comprising the pusher arm **166** afford a somewhat more positive compacting and stack control effect than may be achieved with the stacker **54**. Each of the two stackers can be constructed to accommodate a minimum of 3000 record cards of conventional thickness, but neither of the stackers is in any way controlled, in its operation, by the thickness of the individual cards.

As has been pointed out hereinabove, control of the instantaneous capacity of the storage magazine **55** is determined by the total accumulation of cards in the stack and not by the number of cards therein. Consequently, in the case of both embodiments of the invention the stacker operates entirely independently of the thickness of the individual record cards, a highly advantageous feature particularly where the stacker is to be associated with a photocomposing machine or other business machine that may be required to accept record cards of varying manufacture and of varying thickness.

Hence, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. A card stacker for a photocomposing machine or other business machine from which record cards are ejected, in vertical alignment, at a relatively high velocity and in a predetermined direction, said stacker comprising: a card storage magazine for receiving cards ejected from said machine and storing said cards in vertical alignment, said magazine including an adjustable support member for determining the storage capacity of said magazine; a feed roll for engaging said cards and continuing movement of said cards into said storage magazine; said feed roll being mounted for movement in a direction transverse to said direction of ejection of cards from said machine; biasing means urging said feed roll into contact with the last card deposited in said magazine; drive means, mechanically connected to said adjustable support member, for adjusting said support member to vary the capacity of said magazine; and control means for increasing the storage capacity of said magazine in accordance with actual need and independently of the thickness of individual record cards, said control means including a control switch electrically connected to said drive means and a sensing arm, movable conjointly with said feed roll, for actuating said control switch between a normal condition and an actuated condition in response to movement of a plurality of record cards of predetermined total thickness into said magazine.

2. A card stacker for receiving and storing record cards ejected in a predetermined direction, in vertical alignment, and at relatively high velocity, from a business machine, said stacker comprising: a card storage magazine, including a vertical support member extending substantially parallel to the direction of card ingress to said stacker; electrically controlled drive means for moving said support member in a transverse direction to change the effective storage capacity of said magazine; fixed guide means for guiding said cards into said storage magazine against said support member; a feed roll for engaging each card to complete movement of said card into said magazine; means for mounting said feed roll for movement toward and away from the cards in said storage magazine; biasing means, connected to said mounting means, for urging said feed roll toward said cards and into engagement therewith; a sensing member engageable with said mounting means for conjoint movement with said feed roll; and a control switch, electrically connected to said drive means and engageable by said sensing member, for energizing said drive means to move said support member away from said drive roll and said guide means and increase the capacity of said storage magazine by a predetermined amount each time the accumulated cards in said magazine move said feed roll through a predetermined distance.

3. A card stacker for receiving and storing record cards

ejected in a predetermined direction, in vertical alignment, and at relatively high velocity, from a business machine, said stacker comprising: a card storage magazine, including a vertical support member extending substantially parallel to the direction of card ingress to said stacker; electrically controlled drive means for moving said support member in a transverse direction to change the effective storage capacity of said magazine; fixed guide means for guiding said cards into said storage magazine to accumulate against said support member; an adjustable card stop for interrupting movement of said cards in said direction of ingress at one of a plurality of predetermined points dependent upon the length of the cards being used; a feed roll for engaging each card to drive said card into engagement with said card stop; means for mounting said feed roll for movement toward and away from the cards in said storage magazine; biasing means, connected to said mounting means, for urging said feed roll toward said cards and into engagement therewith; a sensing member engageable with said mounting means for conjoint movement with said feed roll; and a control switch, electrically connected to said drive means and actuatable by said sensing member, for energizing said drive means to move said support member away from said drive roll and said guide means and increase the capacity of said storage magazine by a predetermined amount each time the accumulated cards in said magazine move said feed roll through a predetermined distance.

4. A card stacker for stacking record cards of either of two different lengths, in sequence and in vertical alignment, as the cards are ejected from a business machine in a predetermined direction, comprising: a pair of flexible tape members for supporting said record cards; a vertical support member, affixed to said tape members and disposed in spaced relation to the original path along which cards are ejected from said business machine, for supporting said cards in vertical alignment; a guide assembly for deflecting each card, as it enters said stacker, from said original path toward said support member; a card stop adjustable to two different positions; a pair of feed rolls for engaging said cards to complete movement thereof into engagement with said card stop; means for mounting said feed rolls in spaced relation to each other between the point of entrance of said cards into said stacker and said card stop and for maintaining only one of said rolls in card-engaging position, depending upon the length of the cards being stacked; drive means, connected to said tape members, for displacing said vertical support member away from said guide assembly to enlarge the space therebetween to accommodate additional cards; control means, including a sensing device for detecting accumulation of cards intermediate said guide assembly and said vertical support member, for actuating said drive means whenever the accumulated cards approach engagement with said guide assembly.

5. A card stacker for a photocomposing machine or other business machine from which record cards are ejected, in vertical alignment along a given path, at a relatively high velocity and at a predetermined rate, said stacker comprising: a card storage magazine for receiving laterally moving cards ejected from said machine and storing said cards in vertical alignment, said magazine including an adjustable support member for determining the storage capacity of said magazine; stop means positioned to engage the leading edge of a card entering said magazine; feed means for engaging and continuing movement of said cards into said storage magazine until arrested by said stop means; guide means for deflecting each card through an acute angle, from said path, toward said stop member; drive means, mechanically connected to said adjustable support member, for adjusting said support member to vary the capacity of said magazine; control means, connected to said drive means, for increasing the storage capacity of said magazine in accordance with actual need and independently of the thickness of individual record cards, said control means including a sensing device connected to said feed means and actuatable between a normal condition and an actuated condition in response to movement of a plurality of record cards of predetermined total thickness into said magazine; and card stack compacting means, including a reciprocating pusher element projecting through said guide means and engageable with said record cards in said magazine, for pushing the trailing ends of said cards toward said support member each time an additional card is deposited in said magazine.

6. A card stacker for receiving and storing record cards ejected in a predetermined direction, in vertical alignment, and at relatively high velocity, from a business machine, said stacker comprising: a card storage magazine, including a vertical support member extending substantially parallel to the direction of card ingress to said stacker; stop means positioned to engage the leading edge of a card entering said magazine; feed means for engaging and continuing movement of said cards into said storage magazine until arrested by said stop means; electrically controlled drive means for moving said support member in a transverse direction to change the effective storage capacity of said magazine; fixed guide means for guiding said cards into said storage magazine to accumulate against said support member; a resilient baffle affixed to said fixed guide means and projecting toward said support member to press said cards against said support member; sensing means, engageable with said accumulated cards and movable from a normal position to an actuation position in response to accumulation of cards to a predetermined point adjacent said guide means; and a control switch, electrically connected to said drive means and engageable by said sensing means, for energizing said drive means to move said support member away from said guide means and increase the capacity of said storage magazine by a predetermined amount each time the accumulated cards in said magazine move said sensing means past said predetermined point.

7. A card stacker for receiving and storing record cards ejected in a predetermined direction, in vertical alignment, and at relatively high velocity, from a business machine, said stacker comprising: a card storage magazine, including a vertical support member extending substantially parallel to the direction of card ingress to said stacker; stop means positioned to engage the leading edge of a card entering said magazine; feed means for engaging and continuing movement of said cards into said storage magazine until arrested by said stop means; electrically controlled drive means for moving said support member in a transverse direction to change the effective storage capacity of said magazine; fixed guide means for guiding said cards into said storage magazine, at an acute angle relative to said predetermined direction, to accumulate against said support member; cyclically driven reciprocable pusher projecting through said guide means for pushing the trailing ends of the accumulated cards toward said support member each time another card enters said magazine; sensing means, engageable with said accumulated cards and movable from a normal position to an actuation position in response to accumulation of cards to a predetermined point adjacent said guide means; and a control switch electrically connected to said drive means and engageable by said sensing means for energizing said drive means to move said support member away from said guide means and increase the capacity of said storage magazine by a predetermined amount each time the accumulated cards in said magazine move said sensing means past said predetermined point.

8. A card stacker for stacking record cards or the like, in sequence and in vertical alignment, as the cards are ejected from a business machine in a predetermined direction, comprising: a pair of flexible tape members for supporting said record cards; a vertical support member, affixed to said tape members and disposed in spaced relation to the original path along which cards are ejected from said business machine, for supporting said cards in

vertical alignment, a guide assembly for deflecting each card, as it enters said stacker, from said original path toward said support member; stop means for limiting the movement of the cards into the stacker; feed means for engaging the cards and continuing their movement into the stacker until arrested by the stop means, and including a continuously driven feed member mounted for movement toward and away from said support member and bias means urging said feed member toward said support member; electrically operable drive means, connected to said tape members and including a drive shaft, for displacing said vertical support member away from said guide assembly to enlarge the space therebetween to accommodate additional cards; control means, including a sensing device mechanically connected to said feed member for detecting accumulation of cards intermediate said guide assembly and said vertical support member, for actuating said drive means whenever the accumulated cards approach engagement with said guide assembly; and manually operable drive means, engageable with said drive shaft, for displacing said vertical support member back toward said guide assembly upon removal of accumulated cards from said stacker.

9. A card stacker for stacking record cards or the like, in sequence and in vertical alignment, as the cards are ejected from a business machine in a predetermined direction, comprising: a pair of flexible tape members for supporting said record cards; a vertical support member, affixed to said tape members and disposed in spaced relation to the original path along which cards are ejected from said business machine, for supporting said cards in vertical alignment; a guide assembly, including a fixed guide approximately parallel to said support member and a resilient guide projecting inwardly from said fixed guide, at an acute angle, toward said support member for deflecting each card, as it enters said stacker, from said original path toward said support member; stop means for limiting the movement of the cards into the stacker; feed means for engaging the cards and continuing their movement into the stacker until arrested by the stop means, and including a continuously driven feed member mounted for movement toward and away from said support member and bias means urging said feed member toward said support member; drive means, connected to said tape members, for displacing said vertical support member away from said guide assembly to enlarge the space therebetween to accommodate additional cards; control means, including a sensing device mechanically connected to said feed member for detecting accumulation of cards intermediate said guide assembly and said vertical support member, for actuating said drive means whenever the accumulated cards approach engagement with said guide assembly; and compacting means engageable with the face of a card for pressing said cards toward said vertical support member in a compact stack.

References Cited in the file of this patent

UNITED STATES PATENTS

2,012,561	Grupe	Aug. 27, 1935
2,631,846	Sabee	Mar. 17, 1953
2,742,286	Williams et al.	Apr. 17, 1956
2,797,098	Brodie	June 25, 1957
2,849,236	Beaulieu	Aug. 26, 1958
2,877,885	Wheeler	Mar. 17, 1959
2,926,910	Martin	Mar. 1, 1960
2,930,611	Pearce	Mar. 29, 1960

FOREIGN PATENTS

2,872,190	France	Feb. 3, 1960