June 24, 1958 A. NELSON ET AL 2,840,217

DUAL SHEET FEED MECHANISM

Filed Dec. 24, 1953 5 Sheets-Sheet 1

FIG. 1.

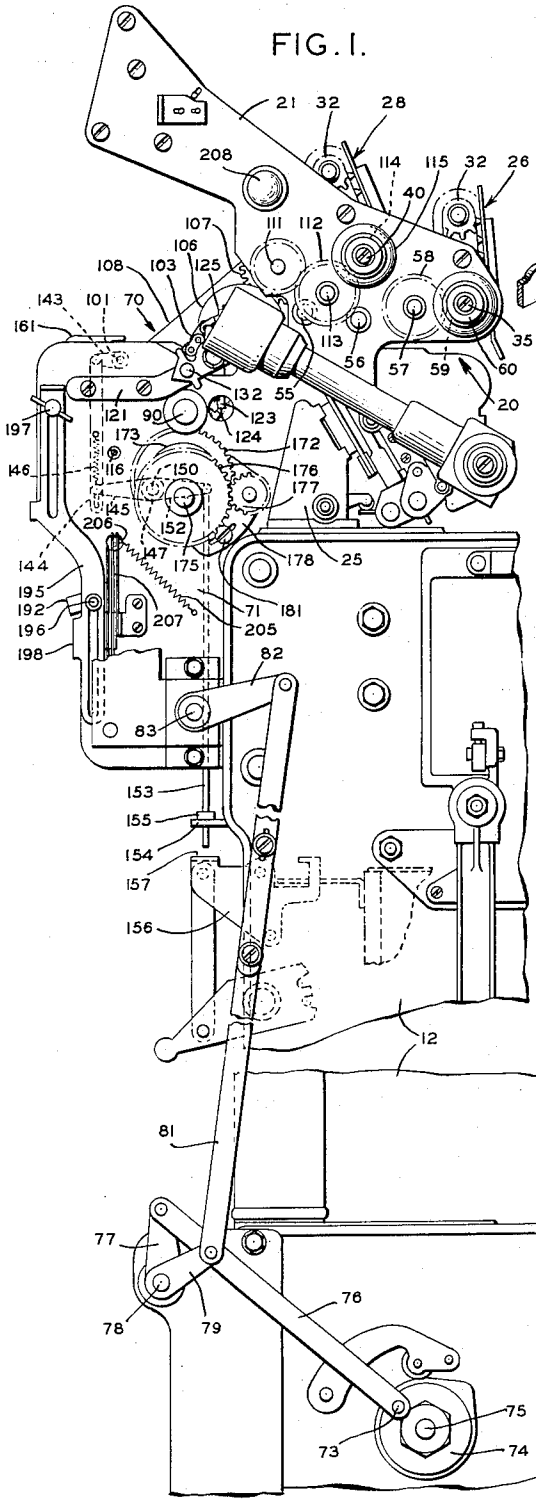
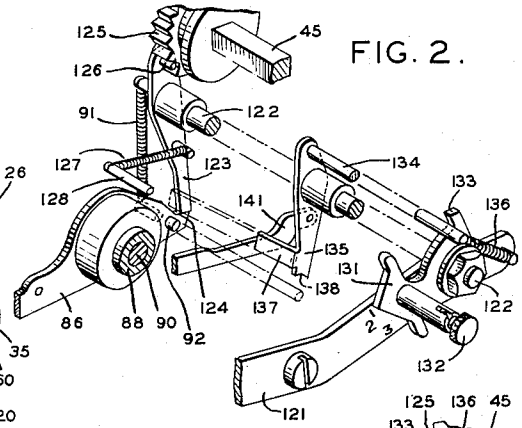


FIG. 2.



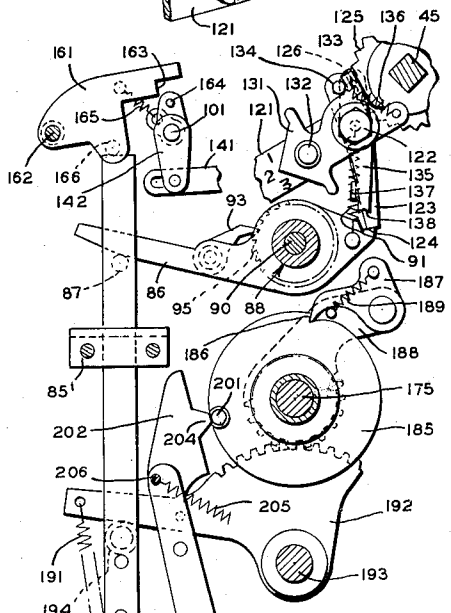
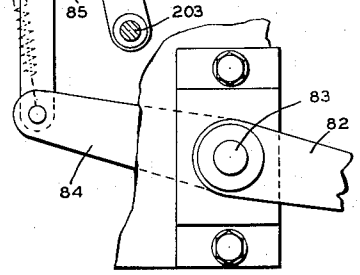


FIG. 3.



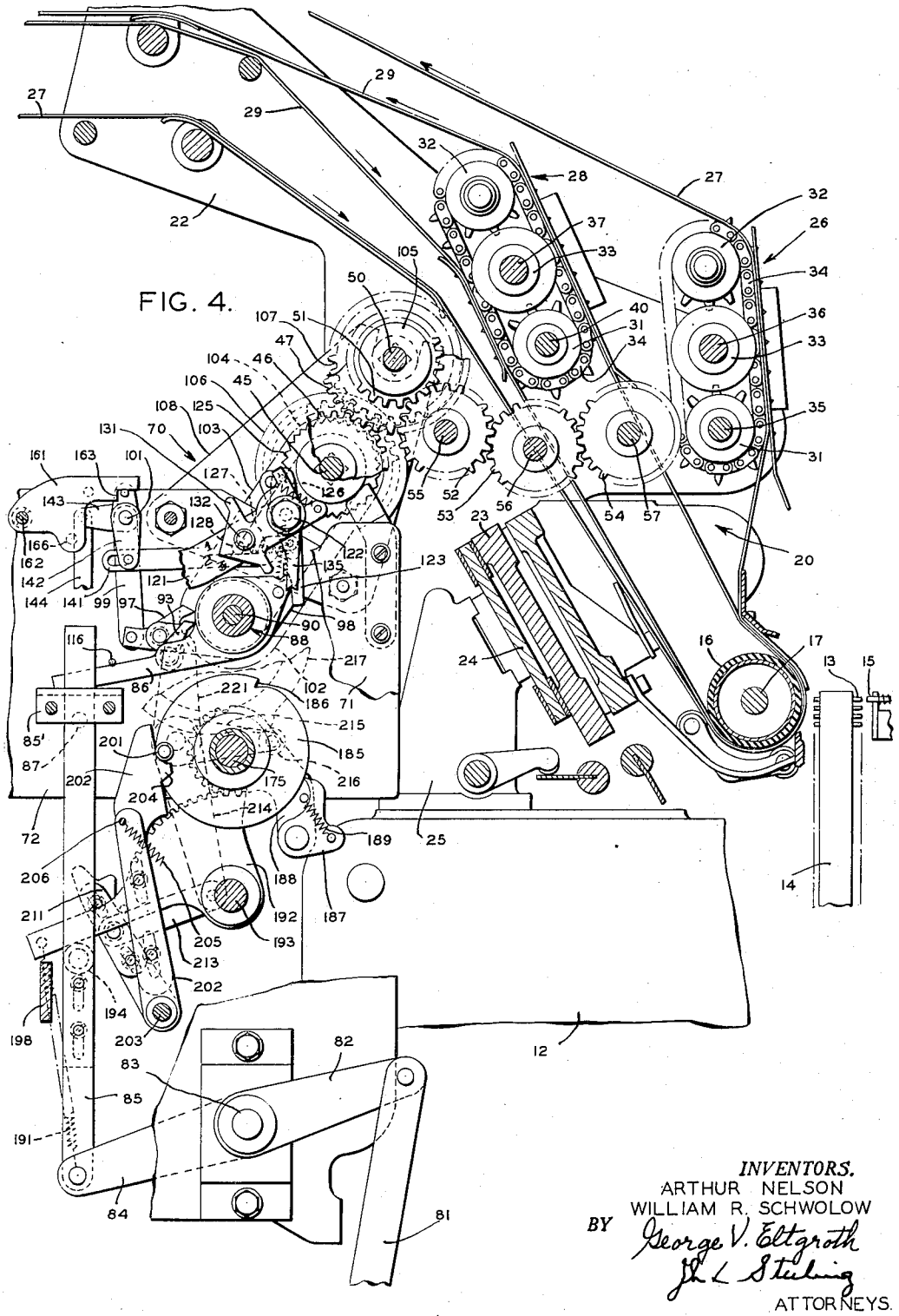
INVENTORS.
ARTHUR NELSON
WILLIAM R. SCHWOLOW
BY George V. Eltgroth
John L. Stuebing
ATTORNEYS.

June 24, 1958 A. NELSON ET AL 2,840,217

DUAL SHEET FEED MECHANISM

Filed Dec. 24, 1953 5 Sheets-Sheet 2

FIG. 4.



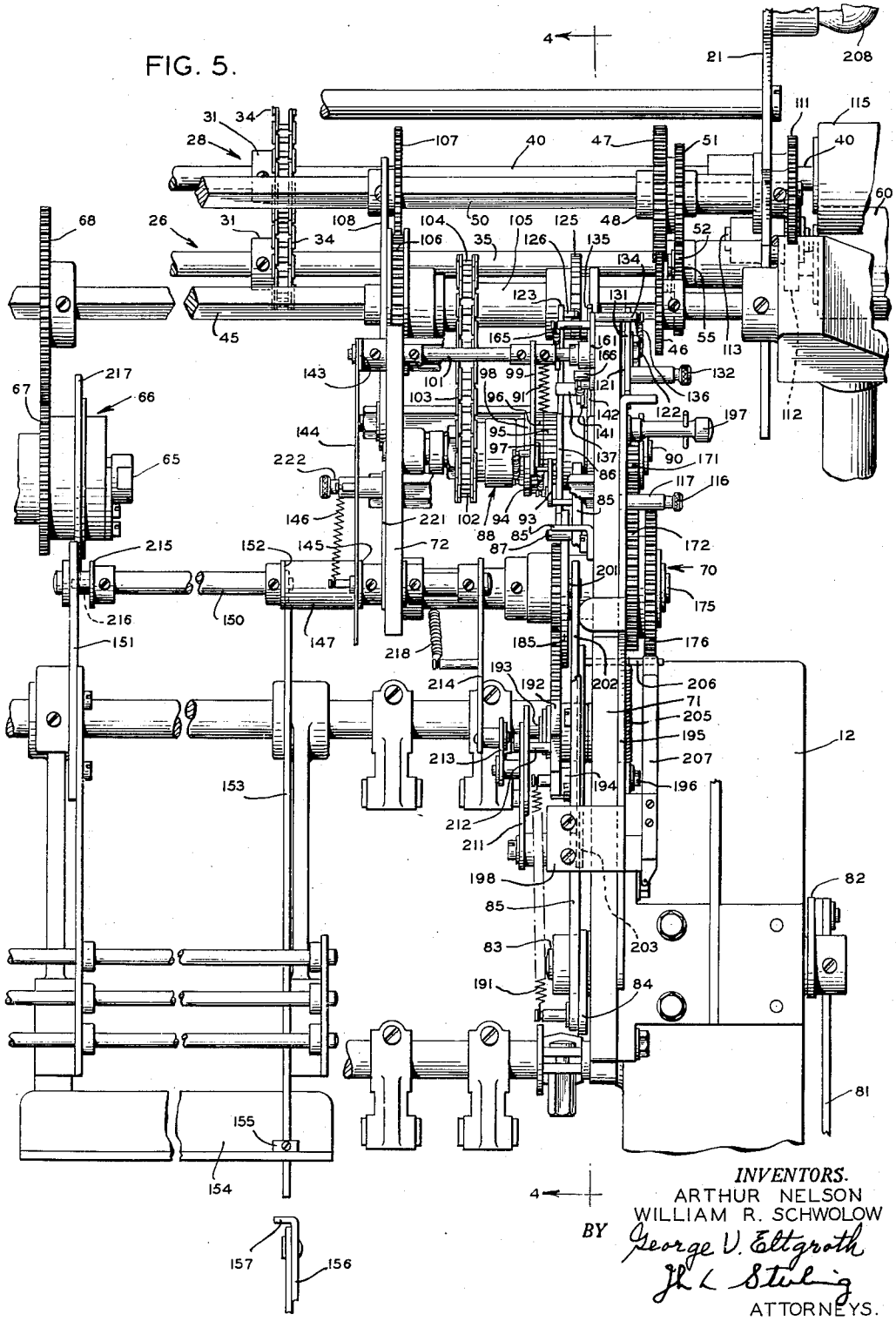
INVENTORS.
ARTHUR NELSON
WILLIAM R. SCHWOLOW
BY George V. Eltgroth
J. L. Stuhlman
ATTORNEYS.

June 24, 1958 A. NELSON ET AL 2,840,217

DUAL SHEET FEED MECHANISM

Filed Dec. 24, 1953 5 Sheets-Sheet 3

FIG. 5.



INVENTORS.
ARTHUR NELSON
WILLIAM R. SCHWOLOW
BY George V. Ettgroth
Jh L Stuling
ATTORNEYS.

June 24, 1958 A. NELSON ET AL 2,840,217

DUAL SHEET FEED MECHANISM

Filed Dec. 24, 1953 5 Sheets-Sheet 4

FIG. 6.

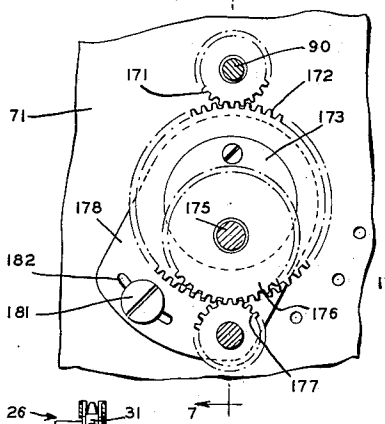


FIG. 7.

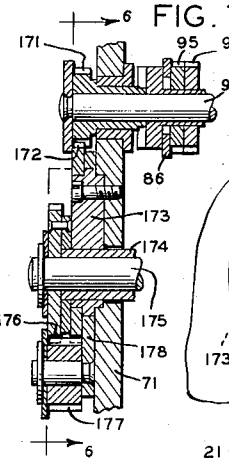
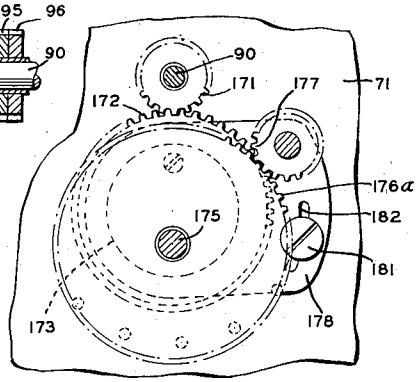


FIG. 8.



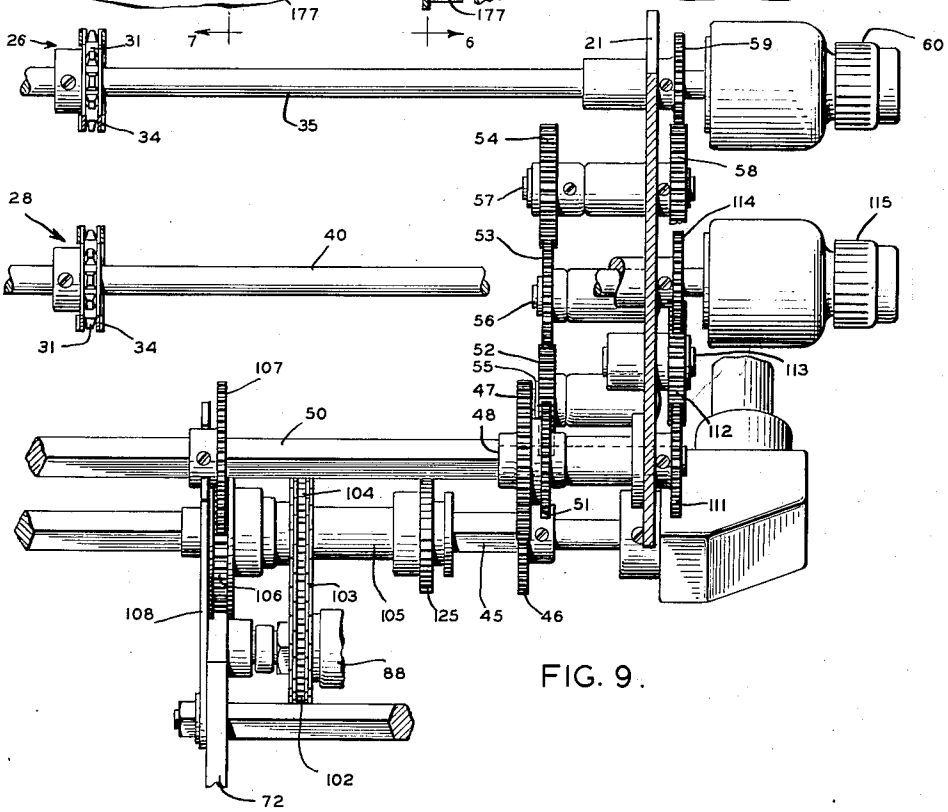


FIG. 9.

INVENTORS.
ARTHUR NELSON
WILLIAM R. SCHWOLOW
BY George V. Eltgroth
Jh L Stebing
ATTORNEYS.

June 24, 1958 A. NELSON ET AL 2,840,217

DUAL SHEET FEED MECHANISM

Filed Dec. 24, 1953 5 Sheets-Sheet 5

FIG. 10.

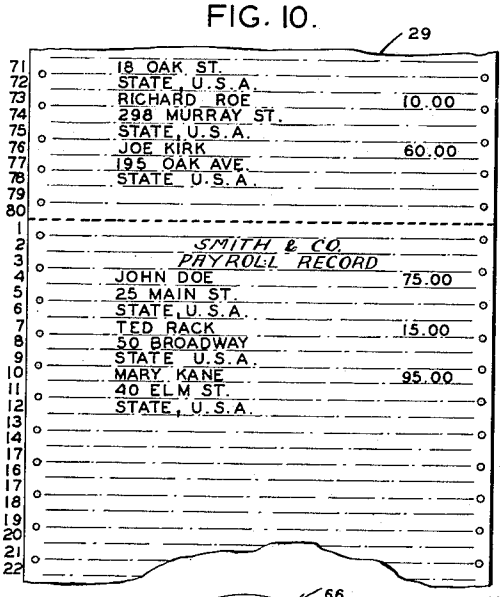
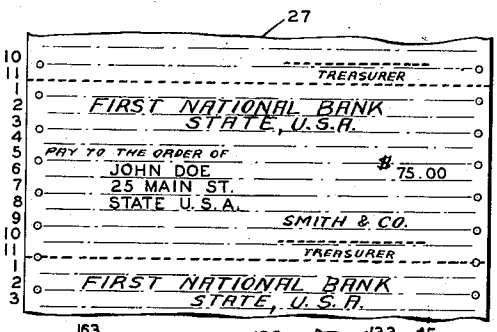
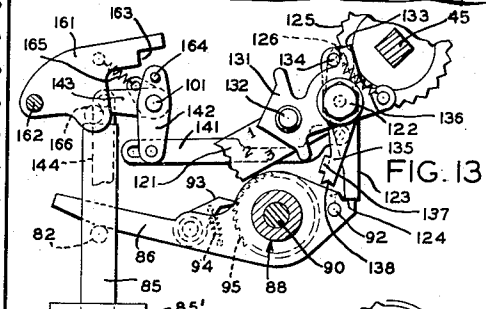
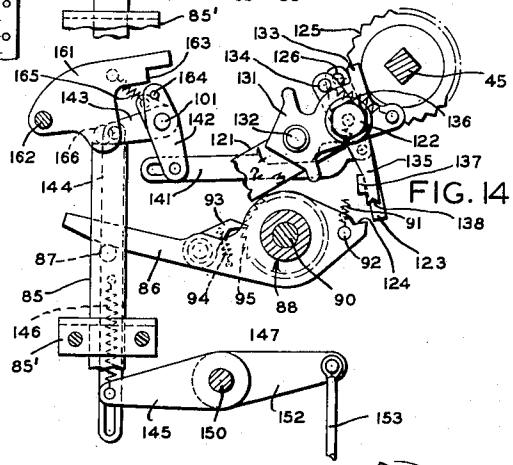
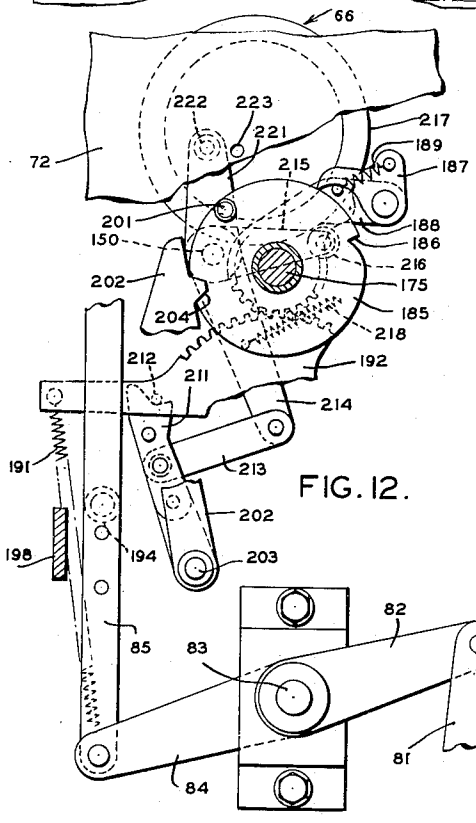


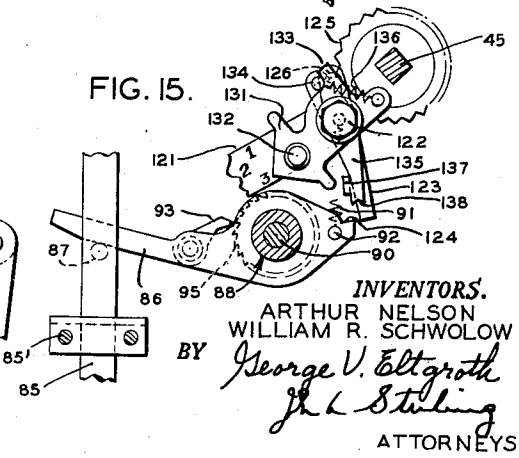
FIG. 11.











INVENTORS.
ARTHUR NELSON
WILLIAM R. SCHWOLOW
BY George V. Eltgroth
J. L. Stirling
ATTORNEYS.

United States Patent Office 2,840,217 Patented June 24, 1958

2,840,217

DUAL SHEET FEED MECHANISM

Arthur Nelson and William R. Schwolow, Norwalk, Conn., assignors, by mesne assignments, to Sperry Rand Corporation, New York, N. Y., a corporation of Delaware

Application December 24, 1953, Serial No. 400,248

17 Claims. (Cl. 197—133)

This invention relates in general to means for automatically feeding sheets or strips of flexible material through a succession of spaced positions with respect to an operating station therefor, and has more particular relation to mechanism enabling the simultaneous feeding of a plurality of said sheets to an operating station which is common thereto, and wherein the feeding ratio between said sheets may be varied at will with the separate driving mechanism for each sheet being independently controllable.

The invention is disclosed in an embodiment adapted for feeding dual sheets of paper, each of which may contain prepared business forms presenting unequal lengths, respectively, of line space area, to the printing platen of a business machine such as a record controlled tabulator, although it should be understood that the invention may be readily adapted for feeding dual strips or sheets of materials other than paper to a common operating station other than the printing platen of a business machine.

Business machines of the class herein disclosed are ordinarily equipped with paper feed drive mechanism of the automatic compensating type which may be controlled in accordance with any one of a variety of operating conditions occurring in the machine to impart an occasional long or compensating feed stroke to the paper in place of the usual line spacing feed stroke. When the paper being fed comprises prepared business forms, a long or compensating feed stroke may be employed to advance the sheet from any printing position on a preceding form to the desired first printing position on a succeeding form. There are many tabulating machine operations, such as the printing of payroll checks, wherein the nature of the original form, hereinafter referred to also as the primary form, calls for only a few or even one line of printing per form, upon the completion of which the feeding mechanism is controlled to effect a long compensating stroke so as to present the next succeeding original form to printing position. In this type of tabulating machine operation it is not required that the duplicate copy form, hereinafter also referred to as the secondary form, be identical with the original form or to even follow the same line space pattern of the original form. Preferably it is desired to employ a secondary form having considerably greater line space area thereon wherein, for paper saving reasons, the copied data would be recorded in successive line space positions regardless of the line spacing and compensation of the original primary form.

To achieve this desired type of operation, the mechanism of the invention includes separate means for driving the secondary form feeding devices and operating in conjunction with the means for driving the primary form feeding devices in such manner that the secondary form will line space for every line spacing action of the primary form, but without affecting a compensating feed stroke for each compensating feed stroke of the original or primary record form.

Separate means are provided for effecting a compensating feed of the secondary record forms, independently of the means for compensating the primary record form, and which means may be effective either when the secondary form reaches the last line space position thereon, hereinafter referred to as over-capacity compensation, or whenever the line space positions remaining on a secondary form are insufficient in number to accommodate the number of complete lines to be printed on a new original form, hereinafter referred to as area compensation. Means are provided for readily adjusting the secondary form drive mechanism to conform to the number of line spaces on a secondary form regardless of the line space area of the original primary record form and to adjust the extent of secondary form compensating strokes in accordance with the various heading areas on the secondary forms and/or the maximum number of line spaces required for completing a full original form. Settable means are provided to determine the extent of the normal line spacing movement of the secondary form, i. e. single or double line spacing, independently of the normal spacing of the primary record form, which means may also be set for machine control so as to automatically vary the normal line spacing movement of the secondary form upon the occurrence of a particular machine function such as, for example, a total taking operation.

It is therefore an object of the invention to provide improved means for differentially feeding separate sheets or strips of material to a common operating station.

It is a further object of the invention to enable compensatory feeding to a common operating station of each of a plurality of strip or web materials having successively arranged thereon work receiving areas of different lengths.

Another object of the invention is to enable the concurrent feeding to a common operating station of plural strips of material each containing separate form areas of different lengths wherein the compensating feed of each strip between successive forms is independent of the feed of the other strip.

Another object of the invention is to provide improved means for adjusting the feed driving means to accommodate forms of different lengths.

A still further object of the invention is to enable, in a machine having dual strip feeding mechanism, the normal spacing movement of either strip to be varied under control of a predetermined machine function.

Other objects and features of the invention will be apparent from the following specification when read in conjunction with the drawing, wherein—

Fig. 1 is a left hand side elevation of the rear portion of a tabulating machine with the additional paper feed drive mechanism according to the present invention mounted thereon;

Fig. 2 is an isometric detail view of settable line space control mechanism for the additional or secondary paper feeding mechanism;

Fig. 3 is a fragmentary view in side elevation of the actuating means for the secondary paper feed drive mechanism;

Fig. 4 is a left hand side elevation, in section, of the paper carriage and secondary drive mechanism, taken approximately along the lines 4—4 of Fig. 5;

Fig. 5 is a rear elevation of the mechanism shown in Fig. 4 and including a portion of the primary paper feed drive mechanism;

Fig. 6 is a detailed view of gear mechanism which may be adjusted to accommodate forms of varying length;

Fig. 7 is a sectional view taken along the lines 7—7 of Fig. 6;

Fig. 8 is a view similar to Fig. 6 but showing the parts in a different adjusted position;

Fig. 9 is a fragmentary plan view illustrating the separate gear trains extending from the primary and secondary drive mechanisms to their respective paper impelling mechanisms;

Fig. 10 is a view of the duplicate copy form or ledger sheet illustrating the printing thereon as arranged and spaced in accordance with the secondary form feed mechanism;

Fig. 11 illustrates the relatively shorter primary form or check voucher with the identical printing thereon spaced in accordance with the primary form feeding mechanism;

Fig. 12 is a fragmentary side elevation of the mechanism for effecting a compensating feed stroke for the secondary forms; and

Figs. 13, 14 and 15 are detailed views in different operative positions of presettable means for controlling the line spacing action of the secondary form drive mechanism.

The invention is shown herein as adapted for a record controlled tabulator having a universal compensating paper feed drive mechanism of the type fully disclosed in patent to J. H. McDonnell, No. 2,476,449, issued July 19, 1949, the tabulator being more fully disclosed in the patent to J. Mueller, No. 2,381,361, issued August 7, 1945. As more fully disclosed therein, the tabulator is housed in a frame work including lower and upper side frame castings **11**, **12** respectively, only the left hand frame castings being shown herein. Printing is effected by type elements **13**, see Fig. 4, carried by each of a series of differentially settable type bars **14** which rise each operating cycle to bring their desired type element into horizontal alignment with a type firing pin **15**. At the proper time of each machine cycle, type hammers, not shown here, are released to strike the associated firing pin **15** and thereby drive the selected type element **13** against a printing platen **16**. The platen is supported by a platen shaft **17** which is suitably journalled in the frame work of a paper carriage **20**. The carriage frame work includes left and right hand frame plates **21**, **22** held in suitable spaced relation by a plurality of transverse tie rods and a transverse carriage mounting bar **23** which has grooved portions slide-fitted in the usual way to a carriage mounting rail **24** supported by legs **25** secured to the top of the tabulator side frame castings **12**. This construction enables the paper carriage to be adjustably positioned laterally to the type bars **14**.

The structure of the paper carriage **20** has been somewhat modified from that shown in the above mentioned patents in order to enable the simultaneous feeding of two or more separate sheets of record forms about the platen **16** and without the drive or rotation of the platen **16** itself. For this purpose the carriage is provided with two pairs of paper impelling mechanisms, one of each pair being shown in Fig. 4, which mechanisms may be of any suitable known type and shown herein as being of the chain and sprocket type, the devices **26** being employed for gripping and feeding the primary or original record form sheet **27**, and the devices **28** being disposed and adapted to grip and feed the secondary or duplicate record form sheet **29**. The paper impelling devices **26**, **28** are all of identical construction and each includes a pair of chain sprockets **31**, **32** mounted on individual frame plates having a central hub portion **33**. The lower sprocket wheel **31** in each unit is the driving sprocket and the chain **34** driven thereby is provided with pins adapted to engage marginal perforations in the respective record form sheets **27**, **29** associated with each device. The primary form feeding devices **26** are driven from a drive shaft **35** suitably journalled in the side frame plates **21**, **22** of the paper carriage **20** and to which shaft **35** the sprocket wheels **31** of the primary feed devices are adjustably secured. Said primary feeding devices are further supported by one of the transverse tie rods **36** of the paper carriage to which the central hub portion **33** of the primary feeding devices are slide-fitted. The secondary paper gripping and feeding devices **28** are mounted in a similar manner on a tie rod **37**, the driving sprocket **31** of said secondary feed devices being secured at the desired position along a secondary drive shaft **40** which is also suitably journalled in the side frame plates **21**, **22** of the paper carriage. It will of course be understood that each pair of sheet impelling devices **26**, **28** may be adjustably located in any desired position along their respective mounting means, as above described, so as to engage with marginal perforations in sheets of any desired width, and that each device is also provided with suitable guiding means for maintaining their respective sheets in engagement with the pins on the respective feeding chains **34**. The primary form sheet **27**, which may be of any continuous type, such as fan folded or rolled, is fed from its supply source, not shown herein but disposed in suitable relation to the rear of the tabulator, through the open frame work of the paper carriage directly to the under side of the platen **16** and around the platen to the primary feeding devices **26** and then back towards the rear of the machine to any suitable receiving mechanism, not shown herein. The secondary form sheet **29**, which also may be of any continuous type, feeds from its respective supply source, also not shown, to the rearward side of the secondary feeding devices **28**, thence around the platen and to the forward side of the feeding devices **28** and thence rearwardly to any suitable receiving mechanism at the rear of the machine, not shown herein. It will be apparent that in operations wherein the respective feeding devices **26**, **28** are laterally positioned so as to feed the respective sheets around the platen **16** in superposed relation, a sheet of carbon paper or any other suitable imprint transfer medium carried by either sheets so as to lie between the sheets as they travel about the platen will be effective for transferring the original imprint from the type elements **13** to the secondary form sheet **29**. It should be mentioned here however that there may be applications wherein the primary and secondary form sheets are not fed around the platen in superposed relation but are fed in side by side relation wherein the machine could be wired so as to print identical data by the type bars **14** associated with the respective primary or secondary sheets or wherein the machine could be conditioned to print only selected data from a record card on one of the sheets and other data from the same card on the other sheet, in either of which cases the secondary form sheet **29** would receive a direct or original imprint from its associated type bars. Accordingly, it should be understood that although the terms primary and secondary are employed herein to differentiate between the respective mechanisms and form sheets which, when fed in superposed relation, result in an original duplicate copy sheet, the terminology is thus employed for convenience of description only and is not intended to imply that the secondary form sheet and associated feeding mechanism be considered only as means for obtaining a duplicate or transfer copy imprint of data printed directly on the primary form sheet **27**.

The primary sheet impelling devices **26** are actuated by an automatically compensating drive unit of the type fully shown and described in the aforesaid patent to McDonnell, No. 2,476,449. As fully described in said patent, the drive unit operates to rotate a squared shaft **45** (corresponding to the shaft 155 of said patent) which is suitably journalled in the side frame plates **21**, **22** of the paper carriage **20**. In the present instance however, an additional gear train has been provided, running from the shaft **45** to the shaft **35** associated with the primary sheet feeding device **26**, so as to enable the independent actuation of the primary form feeding device **26** without concurrent rotation of the platen **16** which is preferably disconnected from the shaft **45** by means of the usual platen clutch mechanism, for dual form feeding operations. Said additional gear train includes, as can be best

seen in Fig. 9, a gear **46** secured fast to the shaft **45** and meshing with a gear **47** loosely mounted on a sleeve **48** suitably supported by a squared shaft **50**, which shaft is more directly associated with the secondary sheet feeding mechanism hereinafter to be described, and like the shaft **45**, is suitably journalled in the side frame plates **21, 22** of the paper carriage. Secured integral with the gear **47** and likewise loosely mounted on the sleeve **48** is a gear **51** which drives a gear train consisting of gears **52, 53, 54**, each gear of said train being carried by individual stud shafts **55, 56, 57** suitably supported in bearings secured to the side frame plate **21** of the paper carriage. The other end of shaft **57**, which lies on the opposite side of the frame plate **21**, carries fast thereon a gear **58** which meshes with a gear **59** secured fast to the shaft **35**. Through the additional gearing above mentioned it will be seen that the rotative movement of the squared shaft **45** which rotates in a clockwise direction, as viewed in Fig. 4, is carried to the shaft **35** so as to actuate the primary sheet impelling device **26** to thereby feed the primary sheet **27** around the platen **16** as heretofore mentioned. Mounted on the end of the shaft **35** is a manually operable knob **60** and associated clutch mechanism whereby the shaft **35** and the associated primary sheet feeding device **26** may be manually actuated independently of the associated driving means if desired for initially aligning the primary sheet **27** relative to the platen **16** in preparation for a dual feeding operation.

As described in the aforementioned patent to McDonnell, 2,476,449, line spacing action of the drive mechanism is effected through ratchet means, including a ratchet wheel, not shown herein, carried by the squared shaft **45** near the right hand end thereof. Said ratchet means operates, each machine cycle when line spacing is required, to step the shaft **45** in a clockwise direction as viewed in Fig. 4, which stepping movement operates through the gearing just described to rotate the primary form feed shaft **35** and associated feeding device **26** in a counterclockwise direction a sufficient distance to effect either single, double or triple line spacing as desired. A long or compensating feed stroke is effected through compensating drive mechanism, partially shown herein, having a compensating drive shaft **65** freely carrying thereon a detachable drum unit **66** (said drum unit corresponding to drum unit 146 of said patent) to which drum unit is secured a compensating drive gear **67** (Fig. 5). Said gear **67** meshes with a gear **68** carried by the squared shaft **45** and, during line spacing rotation of said shaft **45**, is driven by said gear **68** about the compensating drive shaft **65**. As is described in said patent to McDonnell, the compensating drum on which gear **67** is mounted carries a plurality of notched discs set in various adjusted positions so as to drive, when effective, the drum to different predetermined points of its rotation, one of which points may be regarded as the home position. Said home position in the present application represents the first print line on which a new form is to be printed. Whenever the operating conditions of the machine call for a compensating or long feed stroke, means are provided to engage the shaft **65** of the compensating drive mechanism with the proper disc of said drum at whatever point it may have been advanced by line spacing action and thereby drive the drum and gear **67** to the desired point which, when a new form is to be started, would be for the balance of one complete rotation and back to the home position. This compensating stroke is effected within one machine cycle and operates through the shaft **45** and aforementioned gearing to drive the primary form feeding device **26** the exact distance to bring a new succeeding form on the primary form sheet **27** into first line print position. It will of course be understood that the size of gear **67** must correspond to the length of the primary forms being fed so that one complete rotation of the gear will be effective for feeding the primary form sheet **27** exactly one complete form length to thereby define one primary form feed cycle. In order to facilitate the interchanging of the gears **67, 68**, to obtain various driving ratios corresponding to the length of the primary forms being fed, the drum unit **66** upon which gear **67** is supported is detachably mounted as aforesaid on the shaft **65** and for this purpose, as described in said patent spring urged clip means pivoted on the drum unit cooperate with an annular groove in the shaft **65** for detachably securing the desired drum unit on said shaft. A plurality of gears **68** may be provided on shaft **45** so as to operatively engage with any one particular gear **67** which may be employed.

From the foregoing it will be apparent that all of the feeding functions and control thereof exercised by the drive mechanism as set forth more fully in said patent to McDonnell, 2,476,449 in driving the platen of said patent, may similarly be effective in the instant application, through the additional gear train heretofore described, in operating the primary form impelling device **26** so as to thereby enable identically similar control over the feeding of the primary form sheet **27**.

The mechanism for driving the secondary form sheet **29** is mounted as a separate auxiliary drive unit **70** in frame work including upright frame plates **71, 72** suitably secured in spaced relation to the upper rear portion of the left hand machine frame casting **12** (Fig. 4). The secondary form drive unit is operated through linkage, as seen in Fig. 1, extending downward to the base of the machine and connecting with a crank pin **73** carried by a crank disc **74** mounted on the main drive shaft **75** of the machine. A link **76** connects the crank pin with a rock arm **77** mounted on a short stud shaft **78** suitably journalled in the base side frame casting **11**. A rock arm **79** also mounted on the shaft **78** is connected by a link **81**, made in two pieces for adjustment purposes, with a rock arm **82** mounted on the outer end of a stud shaft **83** suitably journalled in the outer side frame plate **71** of the secondary form driving unit **70**. Mounted on the inner end of the stud shaft **83**, as seen in Figs. 4 and 5, is a rock arm **84**, the rearwardly extending end of which pivotally connects with and supports an upright push rod **85**, the upper end of which is suitably guided for substantially vertical reciprocatory movement by a slotted bracket **85'** secured to the inner face of the secondary drive unit frame plate **71**. It will be seen that upon each revolution of the main drive shaft **75**, which represents one operating cycle of the tabulating machine, the crank disc **74** and associated linkage above mentioned will be effective for raising and lowering the push rod **85** from and to the position thereof shown in Fig. 4.

Line spacing movement for the secondary form sheet is effected by the upward thrust of the push rod **85** through ratchet means which include a rockable line space actuator **86**, best seen in Fig. 3, the rearwardly extending portion of which is disposed for engagement by a stud **87** projecting from the upper portion of the push rod **85**. Said line space actuator **86** is loosely mounted on a sleeve assembly **88** which is secured fast to a shaft **90** suitably journalled in the side frame plates **71, 72** of the drive unit. A spring **91** connected to a stud **92** near the forward end of the actuator **86** yieldably maintains the actuator in engagement with the stud **87** thereby urging the actuator in a counterclockwise direction when the push rod is lowered. A ratchet pawl **93** pivotally carried by the actuator **86** is urged by a spring **94** (Fig. 14) to engage a ratchet wheel **95** which is one of the elements making up the sleeve assembly **88**. Rocking movement imparted to the line space actuator **86** by the upward stroke of the push rod **85** operates to step the shaft **90** and sleeve assembly **88** in a clockwise direction as viewed in Fig. 2. Mounted on the sleeve assembly **88** adjacent the ratchet wheel **95** is an additional ratchet wheel **96**, best seen in Figs. 4 and 5, operatively engaged by a spring urged pawl **97** suitably pivoted to a stationary support consisting of

a pawl-supporting arm **98** loosely mounted on the sleeve assembly, the rearward end of which is suspended by an arm **99** loosely hung on a rock shaft **101**, hereinafter to be more fully described in connection with the secondary feed control devices, journalled in the side frame plates **71**, **72** of the secondary feed drive unit **70**. The pawl **97**, thus supported in engagement with the ratchet wheel **96**, operates as a holding mechanism to prevent backward counterclockwise movement of the sleeve assembly **88** and shaft **90** during the return downward rocking movement of the line space actuator **86** and pawl **93**.

Also mounted fast on the sleeve assembly **88**, so as to be rotated by the ratchet wheel **95**, is a sprocket wheel **102** (Fig. 5) which, through an endless chain **103**, drives a sprocket wheel **104** freely mounted on a sleeve **105** supported by the squared shaft **45**. Also loosely mounted on the sleeve **105** but connected integrally with the sprocket wheel **104** is a gear **106** meshing with a gear **107** secured to the squared shaft **50**, heretofore mentioned. An upright plate **108**, secured to and serving as a vertical extension of a side frame plate **72** and having portions cut away for accommodating the shafts **50**, **45** provides additional bearing support to the shaft **45** so as to avoid possible separation of the gears **106**, **107** when operating at the higher speeds encountered in long compensating feed strokes. From the foregoing it will be seen that rotation of the shaft **90**, which may be effected in step by step manner by the pawl **93** in normal line spacing action and by other means herein to be described in compensating action, operates through the chain **104**, gears **106**, **107** to drive the secondary form drive shaft **50** independently of and without in any way affecting normal operation of the primary form drive shaft **45**.

Mounted on the end of the shaft **50** which projects outwardly of the carriage side frame plate **21** is a gear **111**, see also Figs. 1 and 9, which, through an intermediate gear **112** carried by a stud shaft **113** suitably journalled in the carriage frame plate **21**, drives a gear **114** mounted fast on the shaft **40**, said shaft **40** directly engages with and drives the secondary sheet impelling devices **28**, as heretofore described. Mounted on the extreme end of the shaft **40** is a manually operable knob **115** and associated clutch mechanism similar to that provided for the primary sheet drive shaft **35**, thereby enabling manual independent operation of the secondary sheet impelling devices **28** to initially align the secondary sheet relative to the platen in preparation for a dual feeding operation.

From the foregoing it will be seen that upon each upward stroke of the line space actuator **86**, the ratchet wheel **95** will be rotated a predetermined distance which movement, through the gearing just described, will result in counter-clockwise rotation of the shaft **40** carrying the secondary form feeding devices **28**, the gear ratio being such that each full stroke of the actuator **86** results in double line spacing of the secondary form sheet **29** about the platen **16**. In order to adjust the secondary form drive mechanism for single line spacing action, means are provided to limit the extent of the stroke of the actuator **86**, said means comprising a manually settable plunger **116** mounted in a plunger housing **117** secured to the outer face of the drive unit side frame plate **71**. The inner end of the plunger **116**, which extends through the frame plate **71**, is disposed to limit the downward return movement of the line space actuator **86** in an intermediate position when the plunger is set to its position for effecting single line spacing action. When thus adjusted for single line spacing action each upward stroke of the push rod **85** may result in only a half stroke for the line space actuator **86**, which stroke, through the gearing just described, will drive the secondary sheet feeding device **28** the required extent to effect single line spacing of the secondary form sheet **29**. When the plunger **116** is set in its "out" position, the inner end of the plunger is clear of the line space actuator **86** permitting the actuator to drop to its lowermost position against bracket **85'** to receive a full stroke upon the next upward stroke of the push rod **85** and thereby effecting double line spacing of the secondary form sheet **29**.

In order to control the secondary form drive unit so as to line space secondary form in selected machine cycles only and in conjunction with the feeding of the primary form sheet, means are provided to disable the operation of the secondary form line space actuator **86** in all machine cycles wherein the primary form sheet **27** is not fed. Said secondary form feed control means are mounted on a supporting arm **121** secured to the upper portion of the side frame plate **71**, which arm, as best seen in Fig. 2, supports a laterally extending pivot rod **122**. Pivotally mounted on the inner end of said rod is a disabling lever **123** disposed in vertical alignment with the line space actuator **86**, the lower end of the lever **123** being engageable with a shoulder **124** formed in the forward end of the actuator. A detent wheel **125** secured fast to the squared shaft **45**, heretofore described and operated by the primary form drive mechanism, is disposed for engagement by a stud **126** projecting from the upper end of the disabling lever **123** so that any rotation of shaft **45** which is occasioned by primary form feed results in a counterclockwise rocking or tripping of the disabling lever **123** against tension of a spring **127** to thereby move the lower end of the lever out of blocking engagement with the shoulder **124** of the line space actuator **86**. The spring **127** is anchored to a stud **128** secured to the frame of the unit. The lever **123** is normally urged by the spring **127** into blocking relation with the shoulder **124** when the actuator **86** reaches the top of its operative stroke, in which position of the lever the stud **126** lies between the teeth of the detent wheel **125**. In the event that there is no spacing of the primary form in the following machine cycle, the detent wheel **125** will not be rotated and the lever **123** will remain in blocking engagement with the shoulder **124** to hold the actuator **86** in its fully raised position so that the upward stroke of the push rod **85** in said following cycle will be inoperative for effecting any line spacing of the secondary form. However, in the event that there is any feeding of the primary form in said following cycle, either a line space feed or a compensating feed, the detent wheel **125** will be rotated to trip the disabling lever **123** to its unblocking position whereupon the actuator **86** will drop to its lowermost position or intermediate position, depending upon the setting of the line space control plunger **116**, so as to receive either a full or half stroke upon the upward stroke of the push rod **85** in said following machine cycle.

In order to permit a variety of modes of operation in the line spacing action of the secondary form drive unit, additional manually settable means associated with the disabling lever **123** are provided so as to enable secondary line spacing each machine cycle regardless of primary form feed in the same cycle, or to permit secondary form feed only in association with primary form feed but with single or double line spacing of the secondary form under control of a predetermined machine function. Said additional settable means includes a selector finger **131** pivotally mounted on the end of the pivot rod **122** and carrying a manually settable plunger **132** cooperating with detent apertures in the support arm **121** whereby the finger may be effectively locked in any one of three adjusted or set positions. Said finger is formed with a vertical shoulder **133** disposed for engaging a stud **134** projecting from the upper end of an actuator limiting lever **135** pivotally mounted on the rod **122** between the selector finger **131** and the disabling lever **123**. Spring **136** stretched between the stud **134** and a lug on the finger **131** yieldably urges the lever **135** and stud **134** clock-

wise into bearing engagement with the shoulder **133**. An ear **137** bent over from the lower end of the lever **135** overlies the lower rearward edge of the disabling lever **123**. The lower edge of the lever **135** is formed with a notch **138** which when the lever is effective engages the stud **92** formed on the forward end of the line space actuator **86** to limit the downward return movement of the actuator in the intermediate position so as to effect only a half stroke line spacing movement on the next upward stroke of the push rod **85** thereby resulting in a single line spacing of the secondary forms.

Fig. 15 illustrates the position of the parts when set in the "3" setting which is the setting employed to achieve secondary form feed each machine cycle regardless of primary form feed.

With the selector **131** set in this "No. 3" position the shoulder **133** thereon bearing against stud **134** holds the disabling lever **135** in a counterclockwise rocked position wherein the notch **138** is clear of the stud **92** and wherein the disabling lever **123** is held by ear **137** clear of the shoulder **124** on the line space actuator **86**. Thus the disabling lever **123** is held dissociated from control by the detent wheel **125** enabling the actuator **86** to impart a line space feed stroke to the ratchet wheel **95** each machine cycle, which feed stroke may be either a single line space movement or a double line space movement depending upon the setting of the line space control button **116**, heretofore described.

With the selector finger **131** set in the "No 2" setting, which is a position thereof shown in Fig. 3, the limiting lever **135** is held by shoulder **133** in an intermediate position wherein the notch **138** is still clear of the stud **92** but however, wherein the disabling member **123** is not held in dissociated relation to the detent wheel **125** and accordingly may engage the shoulder **124** so as to block any return downward movement of the actuator **86** thereby preventing line spacing action in a particular cycle of operation. When the "No. 2" setting is employed, line spacing of the secondary form is effected only in association with the feeding of primary forms, the secondary form line spacing action being either single or double space movement depending upon the setting of the line space control plunger **116**.

When the selector finger **131** is set in the "No. 1" position, which is the position shown in Figs. 13 and 14, the limiting lever **135** is yieldably maintained in its most clockwise rotated setting to place the notch **138** in proper relation to the stud **92** on the actuator **86**, and the disabling lever **123** is free to engage the shoulder **124** of the actuator under control of the detent wheel **125** so as to disable the secondary line space drive in all cycles wherein the primary feed mechanism is inoperative. When in this "No. 1" setting, the actuator **86** when released by the disabling lever **123** upon rotation of the detent wheel **125** indicating primary feed, is released to its half stroke intermediate position wherein the stud **92** thereon is engaged by the notch **138** in the disabling lever **135** to thereby effect single space secondary form sheet feed resulting from each signaled indication of primary form sheet feed. However there are many instances where it is desirable to vary the line spacing operation of the secondary feed mechanism by double spacing the secondary form sheet in selected cycles of machine operation, such as for example in separating the posting of individual accounts wherein the items of each account are printed in single line space arrangement and the individual accounts are separated from each other by double line spacing of the secondary form after printing of the total of each account. For this purpose means are provided for rendering the limiting lever **135** ineffective upon the occurrence of a predetermined machine function, such as a total taking operation, said means including a link **141** (Figs. 2 and 3) pivotally connected at one end thereof to the lever **135** and having a pin in slot connection at the other end thereof with a lever **142** secured fast to the rock shaft **101** heretofore mentioned. Secured to the inner end of the rock shaft **101** is a rock arm **143** connected to the upper end of a link **144** (Fig. 4), the lower end of which link, seen best in Fig. 14, is joined by a pin in slot connection with a rock arm **145**. A spring **146** stretched between the link **144** and arm **145** yieldably maintains the parts in the position shown in Fig. 14 wherein the pin on arm **145** rides in the upper portion of the slot in the link **144**. The arm **145** is secured to a hub **147** loosely mounted on a rock shaft **150** journalled in the secondary drive unit frame plate **72** and a frame rib **151**, see Fig. 5, secured to the rear of the tabulator machine. Said shaft is rocked in conjunction with the operation of compensation control mechanism hereinafter to be described, said rocking movement thereof having no effect on the mechanism now being described since the hub **147** is loosely mounted thereon. Also secured fast to the hub **147** is a rock arm **152** (Figs. 1 and 5) pivotally connected to the upper end of a rod **153**, the lower end of which, as best seen in Fig. 5, is guided for a vertical movement in an angle bracket **154** secured to the rear frame of the tabulator, said rod carrying a collar **155** engageable with the bracket **154** for limiting the downward movement of the rod **153**.

The lower end of the rod **153** is disposed in operative relation to mechanism which is fully shown and described in aforesaid patent to J. Mueller, No. 2,381,361 the description of which is included under the heading "Naught blocks" of said patent. As described therein, the naught block mechanism is provided as a control device for disabling a selected one or group of the tabulator type bars as a result of the sensing and special control holes in a sensed card or upon occurrence of a predetermined machine function such as a total taking operation. Said mechanism includes a naught stop actuator **156**, **157** (lever 806 and lug 805 of said patent), which is pivotally mounted on the rear of the wiring unit of the machine so as to be rocked upwardly in the desired cycle of machine operation either as a result of the sensing of the special control hole or upon the occurrence of the total taking operation as hereinbefore mentioned. Said actuator is disposed to engage a member (bell crank 802 of said patent) which when actuated renders the stop effective for disabling the related type bar of the machine. In the present instance the rod **153** takes the place of the said bell crank of said patent, it being disposed so as to be raised upon the upward rocking movement of said actuator which, when resulting from a total taking operation, occurs just before the beginning of the total cycle. It being understood, as more fully described in said patent, that total taking operations require two cycles, an idle cycle followed by the total cycle, printing being effected at about 165° of the total cycle. The upward movement of the push rod **153** operates to rock the arm **152**, **145** counterclockwise to yieldably pull downwardly the link **144** so as to rock the shaft **101** in a counterclockwise direction and thereby swing the line space actuator limiting lever **135** to the position shown in Fig. 14. When in the position shown in Fig. 14, the limiting lever **135** is clear of the stud **92** so that the next downward stroke of the secondary line space actuator **86** is a complete full stroke to effect full double line spacing upon the next upward advance stroke in the following cycle. In order to render the double line spacing movement effective in the first cycle following the printing of a total means are provided to prevent the rocking of the rock shaft **101** until after printing has occurred in the total cycle, which as heretofore mentioned takes place at about 165° of the total cycle. Said holding means includes an arm **161** (Fig. 14) pivoted as at **162** to the side frame plate **71** of secondary drive unit, said arm being formed with a shoulder **163** disposed to normally bear against a stud **164** near the upper end of the lever **142**, which as heretofore mentioned is fast on the shaft **101**. A spring **165** stretched between the arm **161** and the shaft

yieldably holds the shoulder **163** against the stud **164** so as to block the counterclockwise rocking of the shaft when the arm **161** is in its normal position. A stud **166** formed on the lower depending portion of the arm **161** is disposed for engagement by the upper edge of the push rod **85** as it reaches the upper limit of its operative stroke so as to rock the arm **161** counterclockwise to an unblocking position, such as shown in Fig. 13, each operating cycle of the machine. The push rod **85** is timed to reach the limit of its upward stroke at about 160° of the cycle so as to complete the line spacing or feeding of a secondary form sheet just prior to the time that printing occurs, said push rod reaching the limit of its downward stroke half a cycle later about 340° of the cycle. Fig. 13 illustrates the position of the parts at 160° of a normal tabulating cycle while Fig. 14 shows the relative positions of the same parts at 160° of a total cycle and wherein the naught stop mechanism has been set to effect a double line space feed of the secondary form sheet following the printing of a total. As seen in Fig. 13, the shaft **101** does not rock, as the arm **161** is rocked to unblocking position, enabling the actuator limiting lever **135** to yieldably remain in position to effect single line spacing in the following cycle. In total cycles however, as shown in Fig. 14, the rod **153** is actuated and maintained in a raised position by the naught block mechanism which movement in the early portion of the total cycle and while the arm **161** is still in blocking position operates to stretch the spring **146** whereupon, when the arm **161** is moved to unblocking position at about 160° of the total cycle, the spring **146**, which is stronger than the spring **136** connected to the lever **135**, is effective for rocking the shaft **101** counterclockwise to result in swinging the lever **135** to the position shown in Fig. 14 so as to effect double line spacing in the following cycle.

It will be noted that the movement of the lever **135** to the position shown in Fig. 14 by operation of the rock shaft **101** carries with it, through the bent over ear **137**, the lever **123** to an ineffective position unblocking the line space actuator **86**. Accordingly it will be seen that this control mechanism just described may be employed as a means for enabling secondary form sheet line spacing independently of primary form feed since it effectively dissociates operation of the secondary form line space actuator **86** from control by the detent wheel **125** driven by the primary form feed drive shaft **45**. It will also be noted that this means of controlling the secondary form sheet line space actuator **86** independently of the detent wheel **125** will be effective regardless of whether the selector **131** is set in its "No. 1" or "No. 2" position. Since there frequently are tabulating machine operations employing dual form feed wherein it is desired at times to feed only the secondary form sheet without concurrent feeding of the primary form sheet, the above described mechanism may be employed for this purpose. It should be understood that, as more fully described in aforesaid patent of Mueller, No. 2,381,361, the naught block control devices may be set for control by means other than the total taking control mechanism, for example by the sensing unit upon sensing a predetermined control perforation in a record card, which would thereby enable the naught block device in its control over the secondary form line spacing operation to be responsive to control conditions setup in the machine other than the occurrence of a total taking operation.

The secondary form sheet compensating drive mechanism includes a gear **171**, see Figs. 1, 6, 7 and 8, secured fast to the outer end of the line space drive shaft **90** so as to be rotated by the line space action of the actuator **86** operating through the ratchet wheel **95** as heretofore described. Meshing with the gear **171** is a ring gear **172** supported by a gear mounting hub **173** secured to the side frame plate **71** of the secondary drive unit. Journalled in a bearing **174** which is mounted in the hub **173** at a point off center to the ring gear **173**, is one end of a secondary compensating drive shaft **175** the other end of which is suitably journalled in the side frame plate **72** of the secondary drive mechanism. Detachably secured to the outer end of the shaft **175** is a change gear **176** which is thus disposed adjacent to but in eccentric relation to the ring gear **172**. A pinion **177**, supported in an adjustably positionable carrier arm **178**, has sufficient width so as to lie in the plane of both gears **172**, **176** and mesh with both of said gears to thereby operatively connect the line space drive shaft **90** with the compensation drive shaft **175**. The change gear **176** may be of a variety of sizes so as to correspond with secondary forms of various lengths, the desired ratio being such as to result in the feed of exactly one secondary form length for each complete rotation of the gear **176** and shaft **175** to thereby define one secondary form feeding cycle. Fig. 6 shows the parts when employing a gear **176** for use with relatively short secondary forms while Fig. 8 shows the same parts but employing a substitute larger change gear **176***a* as used when the secondary forms are of a relatively longer length. The pinion carrying arm **178** is rotatably mounted on the hub **173** so as to swing in an arc concentric with the ring gear **172** thereby enabling the pinion **177** to be positioned in whatever point the peripheries of said gears coincide and thereby effect a coupling therebetween as above described. A set screw **181** cooperating with an arcuate slot **182** in the arm **178** and threaded into spaced threaded openings in the frame plate **71** is provided to lock the pinion **177** in any desired setting thereof.

It will be seen that the above described gearing constitutes a variable gear train between the secondary line space drive shaft **90** and the secondary compensation drive shaft **175** wherein the change in gear ratios may be made by substitution of only one element of the gear train, i. e. the change gear **176**, thus eliminating the necessity for substituting pairs of gears to achieve different gear ratios as is the usual requirement in devices of this class wherein the centers of the driving and driven gears in the train are fixed and stationary. In normal line spacing movement the line space shaft **90** is the driving shaft for said variable gear train and operates to step the compensating drive shaft **175** in a counterclockwise direction an extent corresponding to the gear ratio which may be employed. In long or compensating feed strokes the shaft **175** becomes the driving shaft for said variable gear train, it being driven from whatever point the shaft had been stepped by normal line spacing action at the time the compensation stroke became effective an extent sufficient to complete one revolution thereof, i. e. to the home position, which compensating movement through the variable gear train drives the shaft **90** in a clockwise direction the required extent to complete the secondary form feed cycle and thereby feed the next succeeding form on the secondary form sheet **29** into first line print position with relation to the printing platen **16**.

In compensating feed movements, the shaft **175** is driven by a compensating drive disc **185** (Figs. 4 and 12) mounted fast on the shaft **175** on the inner side of the side frame plate **71**, the peripheral edge of said disc having a notch **186** engageable by a pawl **187**. Said pawl is pivoted to a compensating feed actuator **188** which is loosely mounted on shaft **175** adjacent the disc, the pawl being yieldably urged to bear against the edge of the disc by a spring **189**. A portion of the actuator **188** is concentric with the shaft **175** and provided with teeth meshing with the teeth of a gear sector **192** suitably journalled on a stud shaft **193** secured to the frame plate **71** of the drive mechanism. The sector **192** is formed with a tail like extension disposed for engagement by a roller **194** carried by the push rod **85**. A spring **191**, stretched between the tail like extension of the sector **192** and the pivot connection of the push rod **85** with its operating arm **84**, urges the sector **192** in a counterclockwise direc-

tion into bearing engagement with the roller **194**. It will be apparent that in each operating cycle of the machine the upward stroke of the push rod **85** will rock the sector **192**, unless disabled by means hereinafter to be described, so as to rock the actuator **188** and pawl **187** in a counterclockwise direction from the position thereof shown in Fig. 4 to the position shown in Fig. 3. Whenever the compensating drive disc **185** has been advanced in a counterclockwise direction by line spacing action to the point where the notch **186** lies within and coincides with the operative stroke range of the pawl **187**, the pawl will be effective for picking up the disc and driving it to its home position, as shown in Fig. 3, to complete one full rotation of the disc thereby feeding the secondary form sheet **29** to bring a succeeding secondary form into first line print position with respect to the platen **16**.

In order to adjust the length of the compensating feed stroke to correspond with the line space capacity of the particular secondary forms employed, means are provided to adjustably limit the operative stroke of the pawl **187**, said means comprising a capacity adjusting slide **195** guided for vertical movement on studs **196**, best seen in Fig. 1, secured to the rear of the side frame plate **71** of the drive unit, the upper stud being threaded to receive a lock nut **197** for securing the slide in an adjusted position. A bent over ear **198** formed on the slide is disposed to underlie the tail like portion of the sector **192** thereby providing an adjustable limit for the counterclockwise rocking of the sector **192** to adjustably determine the length of the operative stroke of the pawl **187**. When the machine is operating with the capacity compensation feature, the slide **195** is adjusted to limit the clockwise return movement of the pawl **187** at the exact point to engage the notch **186** on the drive disc **185** when the notch **186** has been advanced by line space action to the point corresponding to the last printing line of a secondary form, whereupon the next operative stroke of the pawl **187**, after printing has occurred on said last print line of the form, will result in a compensation feed stroke to feed the secondary form sheet past the heading of the next succeeding form and to the first print line of said next succeeding secondary form. In machine operations where capacity compensation is not desired, so as to result in successive line spacing only of the secondary form sheet, the capacity adjusting slide **195** would be moved to its uppermost setting so as to hold the pawl **187** at its most counterclockwise limit of movement, corresponding to the home position of the disc **185**, thus effectively preventing any operative stroke by the pawl and consequently any compensating feed by the disc **185**.

In order to facilitate the registration of the secondary form sheet about the platen initially in preparation for a dual feeding operation, means are provided to signal the machine operator whenever the compensating drive disc **185** reaches its home position, said means including a camming roller **201** (Figs. 3 and 12) carried by the disc **185** and cooperating with a follower arm **202**, made in two pieces for adjustment purposes, and freely mounted on a pivot stud **203** secured to the inner face of the side frame plate **71** of the drive unit. A camming nose **204** formed on the follower arm **202** lies in the arcuate path of movement of the roller **201** so as to be rocked counterclockwise against tension of a spring **205** at a predetermined point in the rotation of the compensating drive disc **185**. The arrangement is such that the arm **202** is rocked by the roller **201** as the drive disc **185** moves into its home position, the position shown in Fig. 3. A stud **206** carried by the arm **202** cooperates with a pair of normally open electrical contacts **207** (Fig. 1) mounted on the outer face of the side frame plate **71**, said contacts being in a circuit running to an indicator lamp **208** mounted on the side frame plate **21** of the paper carriage. Accordingly, when the compensating drive disc **185** is in its home position, the contacts **207** will close to light the single lamp **208** indicating to the machine operator that the compensating drive mechanism is in the position corresponding to the first print line of a secondary form.

From the foregoing it will be apparent that the secondary form capacity compensation feed mechanism operates independently of the primary form feed mechanism and without any control therefrom so as to compensate for heading areas whenever the last print line is reached and regardless of whether the primary form feed mechanism is operating, is line spacing, or is compensating the primary form sheet in the same machine cycle. In many dual feeding operations, wherein the data to be printed on the primary form occupies more than one print line thereof, it is desired to prevent separation of the several lines of data relating to one primary form between two successive secondary forms. For this reason secondary form area compensation feed mechanism is provided, which mechanism operates under control of the primary form feeding mechanism to provide a compensating feed stroke for the secondary form sheet to first print line of a succeeding secondary form whenever the line space area remaining on the preceding secondary form, at the time a new primary form is fed into print position, is insufficient to accommodate the total number of lines which may be required for completing the new primary form. The secondary form area compensation control mechanism, as seen in Figs. 12 and 5, includes an actuator disabling arm **211**, made in two pieces for adjustment purposes, and pivotally mounted on the stud **203**, the upper edge of the arm having a recessed contour disposed for blocking engagement with a stud **212** on the secondary form compensation drive sector **192**. A link **213** pivotally connects the arm **211** with a rock arm **214** secured fast to the rock shaft **150**. As heretofore described, the rock shaft **150** is journalled in the side frame plate **72** and a frame plate **151**, best seen in Fig. 5. Secured to the inner end of the shaft **150** is a follower arm **215** carrying a roller **216** which is disposed for operative engagement by a cam **217** mounted on the drum assembly **66** of the primary form compensating drive unit which, as heretofore mentioned and more fully described in the aforesaid patent to McDonald, No. 2,476,449, makes one complete rotation in the course of feeding the primary form sheet exactly one form length. A spring **218**, connecting the rock arm **214** with the frame of the drive unit, yieldably maintains the roller in engagement with the cam and the disabling arm **211** in effective blocking relation to the actuator **192** until that point in the rotation of the cam wherein the raised surface thereof acting on the roller rocks the disabling arm **211** to its ineffective position to render the sector **192** operative. The cam **217** is positioned on the drum assembly **66** so as to strike the roller **216** at a point in the primary form feed cycle just prior to the time that a new primary form reaches first line print position and after that point of the primary feeding cycle that the preceding form has passed last line print position, that is to say during the compensating feed stroke of the primary form sheet.

In feeding operations where the secondary form area compensation control mechanism is to be employed, the secondary form capacity compensation adjustment slide **195** is set to limit the stroke of the compensating drive actuator **188** and pawl **187** to an extent equivalent to the line space area of the secondary form heading in addition to the maximum line space area required to complete the printing of a primary form. Accordingly in all machine cycles wherein the primary form is merely line spaced, the compensating drive actuator **188** and pawl **187** is held disabled in the position shown in Fig. 12. Each machine cycle wherein the primary form sheet is compensated to bring a new primary form into first line print position the arm **211** will be rocked to an unblocking position thereby enabling the sector **192** and pawl **187** to effect one operative stroke which, in the

event the disc **185** were not sufficiently advanced to bring the notch **186** within the operative range of the pawl **187**, would constitute an idle stroke thereof. As the secondary form approaches the last print line thereof, at which stage of the secondary form feeding cycle the notch **186** of the disc **185** comes within range of the stroke of pawl **187**, the pawl **187** will remain disabled so as not to compensate the secondary form in any cycle wherein the primary form is line spaced, but will be effective to compensate the secondary form sheet only in the machine cycle wherein the primary form sheet is compensated to bring a succeeding primary form into first line print position. In this manner it will be seen that the area compensation feed mechanism operates to control the feeding of a selected predetermined area of the secondary form so as to permit line spacing thereof and printing thereon to complete the printing of several lines of data relating to a previously started primary form, and to compensate thereover so as to prevent printing thereon when such printing represents the first line of data relating to a primary form, thereby avoiding the separation of several lines of data relating to a single primary form among two successive secondary forms.

In operations where secondary form area compensation is not desired, disabling means are provided which include a rock arm **221** secured fast to the shaft **150** at a point adjacent the side frame plate **72** of the secondary drive unit, the upper extremity of said arm carrying a suitably housed settable plunger **222** disposed to cooperate with an aperture **223** formed in said frame plate **72**. Said aperture aligns with the plunger when the arm **221** and shaft **150** is rocked to the position wherein the blocking arm **211** is ineffective, whereby when the plunger is set to engage the aperture the parts are locked in an inoperative position.

Figs. 10 and 11 illustrate sample secondary and primary form sheets, respectively resulting from a dual feeding operation with the area compensation control mechanism being employed, the primary form sheet **27** comprising original payroll checks each having an overall line space capacity of eleven line spaces, as indicated by the numbering to the left thereof, the secondary form sheet **29** comprising ledger forms having an overall line space capacity including the heading of eighty line spaces. The primary form is adapted to receive three lines of printing by the tabulating machine, the first five line spaces of each form representing the heading area with the first line of printing by the machine, to record the name of the payee and the amount of the check, appearing on the sixth line space of the form. In the following machine cycles single line spacing of the primary form brings the seventh line space into position for receiving the street address of the payee which is followed by another line spacing action to bring the eighth line space of the form into position to receiving the state and country address of the payee. In the cycle following the printing of the state address, suitable control mechanism set up in the tabulator initiates a compensating feed stroke for the primary form sheet which in the present example feeds primary form sheet **27** a distance of nine line spaces so as to bring the sixth line space of the next succeeding form into position to receive the name of the next payee and the amount of the next check.

From the foregoing it will be seen that printing of each primary form requires three machine cycles during which primary form feeding action consists of one compensating feed stroke for bringing a succeeding form into its first print line position followed by two single line space movements for obtaining the second and third print line position in each form.

In the case of the secondary form sheet **29**, the heading area takes up the first three line spaces of each form whereby the fourth line space of each form becomes the first print line of the form, which, when in printing position corresponds to the home position of the compensating drive disc **185**, see Fig. 3, as heretofore described. The secondary form sheet **29** will be line spaced by operation of the line space actuator **86** each machine cycle that the primary form feeds regardless of whether the primary form feed is a line space movement or a compensating feed movement so as to receive the duplicate imprint of several primary forms on successive line space positions of the secondary form and until the secondary form compensating drive disc **185** is rotated a sufficient extent to bring the notch **186** therein within range of an operative stroke of the driving pawl **187** associated therewith. It will be noted, in the instant example, that the last line of data relating to a separate primary form happens to fall on the seventy-eighth line space of the secondary form, leaving only two line spaces remaining on the same secondary form. In the event that only capacity compensation is required, the compensating feed adjusting slide **195** would be set to limit the stroke of the pawl **187** for engaging with and picking up the drive disc **185** at a point corresponding to a selected line space position of the secondary form, to initiate a compensating feed stroke regardless of whether said line space contained the first, second or third line of data relating to an individual primary form. In the present example, if employing capacity compensation adjusted to utilize the entire capacity of the secondary form, the adjustment would limit the pawl **187** to a four line space compensating stroke which would take effect after printing had occurred on the eightieth line space and which would result in separating among two secondary forms the data relating to a single primary form, two lines of said data being printed on the two last line spaces of one secondary form and the third line of said data being printed on the fourth line space of the succeeding secondary form. When the secondary form area compensation control mechanism is employed to achieve the results illustrated in Figs. 10 and 11, the compensating adjusting slide **195** is set to limit the stroke of the pawl **187** to an extent corresponding to the line space area of the form heading, which in the present instance is three line spaces plus the number of line spaces required to complete a primary form, which in the present instance is also three line spaces. With such an adjustment, as employed for the instant illustrated example, the notch **186** of the compensating drive disc **185** will be rotated to within the operative range of the pawl **187** as the form is fed to bring the seventy-eighth line space thereof into printing position about the platen. Since, in area compensation operation the secondary compensating drive sector **192** is under control of the cam **217** of the primary drive unit so as to render the secondary actuator **188** disabled in all machine cycles wherein the primary form is line spaced and enabled only in those machine cycles wherein the primary form is compensated, it will be apparent that the first primary form compensating feed stroke taking place after printing has occurred on seventy-eighth line of the secondary form will cause a concurrent compensation of the secondary form so as to prevent the starting of the data relating to a new primary form on the seventy-ninth or eightieth line of the secondary form. However if the first of the three lines of data relating to a separate primary form happened to fall on either line space seventy-seven or line space seventy-eight of the secondary form, then the secondary form would be line spaced to line seventy-nine or eighty to complete the three lines of printing relating to a separate primary form in which case the secondary form would be compensated either after printing on line space seventy-nine or after printing on line space eighty, as the case may be. Although the example herein shown and described illustrates the operation of the area compensation mechanism as employed in dual feeding operation wherein

the primary form is designed to receive three lines of printing thereon, it will be understood that primary forms designed for receiving either fewer or greater number of printing lines may be employed with the same results through the proper setting of the compensating stroke adjustment slide 195. It will also be understood that although the instant example shows a secondary form having an overall capacity of eighty line spaces, secondary forms of other line space capacities may be employed with similar results by correlating the secondary drive gear ratio to the line space area of the secondary form through substitution of a change gear 176 of the corresponding size.

While there has been described what is considered to be a preferred embodiment of the invention, it is obvious that many changes in form may be made without departing from the invention, and therefore it is not intended that the scope thereof be limited to the exact form herein shown and described, nor to anything less than the whole of the invention set forth, and as hereinafter claimed.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a machine of the class described having an operating station for supporting sheet material, subdivided into a succession of form areas, in working relation to certain machine members operable thereon in each of a succession of spaced positions thereof, dual means for feeding separate sheets to said operating station comprising separate sheet impelling devices engaging each individual sheet and operable for spacing the engaged sheet longitudinally past said operating station, and separate driving mechanism for each of said separate impelling devices, each of said driving mechanisms having means operable within a machine cycle for imparting a normal intra-form feed stroke to the associated impelling device and means operable within a machine cycle for imparting a compensating interform feed stroke to the associated impelling device, each said last mentioned means being separately controllable to operate in different machine cycles and to impart compensating feed strokes of different extent than the other.

2. In a machine of the class described having an operating station for supporting sheet material, subdivided into continuous forms each including a work receiving area in working relation to certain machine members operable each machine cycle on successive spaced positions thereof, dual means for concurrently feeding individual sheets containing form areas of different extent to said operating station, said dual means including separate sheet impelling devices engaging with a related sheet and operable for spacing the related sheet past said operating station, and separate means for driving each of said impelling devices, said driving means having means operating within a machine cycle for imparting a normal intra-form feed stroke to the associated impelling device and means operable within a machine cycle for imparting a compensating interform feed stroke to the related impelling device, each of said driving means having means for adjusting the length of the compensating feed stroke in accordance with the distance between the work receiving areas of successive forms on the related sheet.

3. In a cyclically operative machine of the class described having an operating station whereat sheet material, subdivided into successive form areas each having usable and unusable work receiving portions, is supported in working relation to certain machine elements operating at said station, the combination with a sheet impelling device engaging a primary form sheet comprising primary forms each of a predetermined form area for spacing said primary form sheet past said operating station, and primary form driving means for operating said impelling device, said driving means executing a primary form feeding cycle corresponding to the length of the primary form area, each said feeding cycle including a series of short feed strokes for spacing the usable form area past said operating station and a longer compensating feed stroke to pass the unusable form area past said operating station, of an additional sheet impelling device engaging with a sheet comprising secondary forms having a different extent of form area for spacing said secondary form sheet past said operating station, and secondary form driving means actuable independently of said primary form driving means for operating said additional impelling device through a secondary form feeding cycle differing in duration from that of said primary form feeding cycle and comprising a series of short feed strokes and a long compensating feed stroke corresponding to the length of the usable and unusable portions respectively of the secondary form area, each type of feed stroke executed by said primary and secondary form driving means being effected within a machine cycle.

4. In a cyclically operative machine of the class described having an operating station whereat continuous sheet material, subdivided into successive arranged form areas each having usable and unusable work receiving portions, is supported in working relation of certain machine elements operating at said station, the combination with a sheet impelling device engaging a sheet having primary forms of predetermined form area and operable for spacing said primary forms past said operating station, and primary form driving means for operating said impelling device, said driving means executing a primary form feeding cycle corresponding to the length of the primary form area, each said feed cycle including a series of short feed strokes to space the usable portion of the form area past said operating station and a longer compensating feed stroke to pass the unusable portion of the form area past said station, of an additional sheet impelling device engaging with a separate sheet having secondary forms defining a different extent of form area and operable for spacing said secondary forms past said operating station, driving means for operating said secondary sheet impelling device through a secondary form feeding cycle consisting of a series of short feed strokes and a long compensating feed stroke, each type of feed stroke executed by said primary and secondary form driving means being effected within a machine cycle, and means for adjusting said secondary form driving means to correlate the sheet feeding movement within each sheet feeding cycle effected by short feed strokes and a long feed stroke with varying proportions between the usable and nonusable portions respectively of the secondary form area.

5. In a machine of the class described having an operating station whereat continuous sheet material, subdivided into successive form areas each having usable and unusable work receiving portions, is supported in working relation to certain machine elements operating at said station, the combination with a sheet impelling device engaging a sheet having primary forms each defining a predetermined form area and operable for spacing said primary forms past said operating station, and primary form driving means to operate said impelling device, said driving means executing a primary form feed cycle corresponding to the length of the primary form area, each said feed cycle including a series of short feed strokes to space the usable form area past said operating station and a longer compensating feed stroke to pass the nonusable form area past said station, each type of said feed strokes being effected within a machine cycle, of an additional sheet impelling device engaging a separate sheet having secondary forms each defining a different extent of form area and operable for spacing said secondary forms past said operating station, and driving means for operating said secondary form impelling device through a secondary form feeding cycle, said driving means including a line space actuator operable each machine cycle and effective for imparting a series of short feed strokes to said secondary impelling

device and a compensating feed actuator operable each machine cycle and effective upon the completion of a predetermined number of operations of said line space actuator for imparting a long feed stroke to said impelling device, said line space actuator being operable under control of said primary form driving means.

6. In a machine of the class described having an operating station whereat sheet material, subdivided into successive form areas each having usable and unusable work receiving portions is supported in working relation to certain machine elements operating at said station, the combination with a sheet impelling device for engaging a sheet having primary forms defining a predetermined form area and for spacing said primary form sheet past said operating station, and driving means for operating said impelling device, said driving means operating through a primary form feed cycle corresponding to the length of the primary form area and including mechanism for imparting a normal short feed stroke to said impelling device in certain machine cycles and mechanism for imparting a long compensating feed stroke in other machine cycles, of an additional sheet impelling device for engaging a separate sheet containing secondary forms having a different extent of form area than said primary forms and for spacing said secondary forms past said operating station, and driving means for operating said additional impelling device through a secondary form feeding cycle corresponding to the extent of the secondary form area, said secondary form driving means including mechanism rendered effective by the operation of said primary drive means for imparting a normal short feed stroke to said additional impelling device and compensating mechanism rendered effective by the completion of a selected number of short feed strokes for imparting a long feed stroke to said additional impelling device, said secondary form compensating mechanism being effective within a machine cycle and independently of the operation of the said mechanism for imparting a compensating feed stroke to said primary form impelling device.

7. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing a plurality of machine cycles and which primary form feeding cycle may include short line space feed strokes and longer compensating feed strokes, means for concurrently feeding a sheet of secondary forms to said operating station including a secondary form sheet impelling device, means geared to said impelling device and operable each machine cycle under control of said primary sheet feeding means for line spacing said secondary form sheet past said operating station, a secondary compensating feed actuator reciprocable each machine cycle, a compensation drive member geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and engageable by said compensating feed actuator when advanced within the operative range of said actuator, and means for adjustably limiting the operative range of said actuator to determine the line space position on each secondary form whereat said compenating drive member becomes effective.

8. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing the plurality of machine cycles and which primary form feeding cycle may include short line spacing feed strokes and longer compensating feed strokes, means for concurrently feeding a sheet of secondary forms to said operating station including a secondary sheet impelling device, ratchet means operable each machine cycle under control of said primary feeding means and geared to said secondary sheet impelling device to line space the secondary form sheet past said operating station, a compensating feed actuator reciprocable each machine cycle, a compensating drive member geared to said impelling device to execute a cyclic movement corresponding to each secondary form feeding cycle and engageable by said compensating feed actuator when advanced within the operative range of the compensating feed actuator, and means for adjustably limiting the operative stroke of said actuator to determine the line space position on each secondary form whereat said compensating drive member becomes effective.

9. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing a plurality of machine cycles and which primary form feeding cycle may include short line spacing feed strokes and a longer compensating feed stroke, means for concurrently feeding a sheet of secondary form to said operating station including a secondary sheet impelling device, a secondary form line space actuator reciprocable each machine cycle under control of said primary form feeding means, ratchet means geared to said impelling device and operated by said actuator to line space said secondary form sheet past said operating station, a compensating feed actuator reciprocable each machine cycle, a compensating feed drive member geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and engageable by said compensating feed actuator when advanced within the operative range of said actuator, and means for adjustably limiting the operative stroke of said compensating feed actuator to determine the line space position on each secondary form whereat said compensating drive member becomes effective.

10. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing a plurality of machine cycles and which primary form feeding cycle may include short line spacing feed strokes and a longer compensating feed stroke, means for concurrently feeding a sheet of secondary forms to said operating station and including a secondary sheet impelling device, a secondary form line spacing actuator reciprocable each machine cycle under control of said primary form feeding means, ratchet means geared to said impelling device and operated by said actuator to drive said impelling device, a compensating feed actuator reciprocable each machine cycle, a compensating feed drive member geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and having means disposed thereon for engagement by said compensating feed actuator when advanced within the operative range of said actuator, and adjustably settable means for limiting the operative stroke of said compensating feeding actuator to determine the extent of line space feed movement in each secondary form feeding cycle at which said compensating drive member becomes effective.

11. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing a plurality of machine cycles and which primary form feeding cycle may include short line spacing feed strokes and longer compensating feed strokes, means for concurrently feeding a sheet of secondary forms through said operating station including a secondary sheet impelling device, ratchet means geared to said impelling device and operable each machine cycle to line space a secondary form sheet past said operating station, a disabling member controlled by said primary form feeding means to prevent the operation of said ratchet means in machine cycles wherein said primary

form feeding means is inoperative, a compensating feed actuator reciprocable each machine cycle, a compensating drive member geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and having means disposed thereon for engagement by said compensating feed actuator when advanced within the range of said actuator, and means for adjustably limiting the operative stroke of said actuator to determine the extent of line space feeding movement of said secondary form sheet at which said compensating drive member becomes effective.

12. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms arranged successively on a primary form sheet, to said operating station in a primary form feeding cycle embracing a plurality of machine cycles which primary form feeding cycle may include short line spacing feed strokes and longer compensating feed strokes, means for concurrently feeding a sheet of secondary forms to said operating station and including a secondary sheet impelling device, a secondary line space actuator reciprocable each machine cycle, ratchet means geared to said impelling device and operated by said actuator to line space the secondary form sheet past said operating station, a disabling member disposed, when effective, to prevent the reciprocation of said actuator, a compensating feed actuator reciprocable each machine cycle, a compensating drive member geared to said impelling device to execute a cyclic movement corresponding to each secondary form feeding cycle, said drive member having means engageable by said compensating feed actuator when advanced within operative range of said actuator, means for rendering said disabling member ineffective each machine cycle wherein said primary feed means is operative, and means for adjustably limiting the operative stroke of said compensating feed actuator to determine the extent of line space feed movement of said secondary form sheet at which said compensating drive member becomes effective.

13. In a machine of the class described having an operating station and means for feeding each of the plurality of primary forms, arranged successively on a primary form sheet, to said operating station throughout a primary form feeding cycle embracing a plurality of machine cycles and which feeding means includes mechanism normally operable each machine cycle for line spacing said primary form sheet, and mechanism controllable in other selected machine cycles to effect a compensating feed stroke, means for concurrently feeding a sheet of secondary forms to said operating station and including a secondary sheet impelling device, means geared to said impelling device and operable each machine cycle to line space said secondary form sheet past said operating station, secondary compensating drive means geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and adjustably settable to become operable after advancing to a predetermined point in each secondary form feeding cycle, said drive means when operable effecting the completion of a secondary form feeding cycle during the course of a machine cycle, and disabling means controlled by said primary form feeding mechanism for rendering said secondary form compensating drive means operable only in machine cycles wherein said primary form compensating feed mechanism is operated, whereby compensation of the secondary form sheet is rendered dependent upon compensation of the primary form sheet.

14. In a machine of the class described having an operating station and means for feeding each of a plurality of primary forms, arranged successively on a primary form sheet, to said operating station throughout a primary form feeding cycle embracing a plurality of machine cycles and which feeding means includes mechanism normally operable for line spacing said sheet past said operating station and controllable to impart, in certain machine cycles, a compensating feed stroke to said primary form sheet, means for concurrently feeding a sheet of secondary forms to said operating station including a secondary sheet impelling device, means geared to said impelling device and operable each machine cycle to line space said secondary form sheet past said operating station, a secondary compensating feed actuator reciprocable each machine cycle and having an operative feed stroke adjustably limitable to determine the maximum extent of the compensating feed stroke of each secondary form feeding cycle, a secondary compensating drive member geared to said impelling device to execute a cyclic movement corresponding to each secondary form feeding cycle, said driving member having means engageable by said actuator when advanced within range of the operative stroke of said actuator, and disabling means controlled by said primary form feeding mechanism to render said secondary compensating actuator inoperable in machine cycles wherein said primary form line space feed mechanism is effective and to render said secondary form actuator operable in machine cycles wherein said primary form compensating feed mechanism is effective, whereby said secondary form sheet may be compensated only concomitantly with the compensation of said primary form sheet.

15. In a machine of the class described having an operating station and means for feeding each of the plurality of primary forms, arranged successively on a primary form sheet, to said operating station throughout a primary form feeding cycle embracing a plurality of machine cycles and which feeding means includes mechanism controllable to effect line spacing feed and compensating feed in selected machine cycles, means for concurrently feeding a sheet of secondary forms to said operating station including a secondary sheet impelling device, means geared to said impelling device, operable each machine cycle, to line space a secondary form sheet past said operating station, a secondary compensating feed actuator reciprocable each machine cycle, means for adjustably limiting the operative stroke of said actuator to determine a maximum extent of compensating feed within each secondary form feeding cycle, a secondary compensating drive member geared to said impelling device to execute a cyclic movement corresponding to a secondary form feeding cycle and having means engageable by said actuator when advanced within range of the adjusted operative stroke of said actuator, a blocking member normally disposed to prevent reciprocation of said actuator, and means responsive to the compensating feed operation of said primary feed mechanism for rendering said member ineffective, whereby compensation of said secondary form sheet may be effected only concomitantly with compensation of said primary form sheet.

16. In a machine of the class described having an operating station for supporting sheet material in working relation to certain machine members operable thereon and having control mechanism effective only in certain machine cycles, means for spacing a primary form sheet past said operating station, said means including a primary sheet impelling mechanism and means under machine control for driving said impelling mechanism, a secondary sheet impelling mechanism for spacing a secondary sheet past said operating station, a line space actuator reciprocable each machine cycle, means geared to said secondary sheet impelling mechanism and engageable by said actuator for operating said secondary impelling mechanism, a disabling member for said actuator responsive to the operation of said primary sheet driving means for rendering said actuator effective, a limiting member for said actuator presettable to block the reciprocation of said actuator at a predetermined point in the operative stroke thereof, and means operated by said control mechanism to render said limiting member ineffective, whereby said actuator may operate to effect line

spacing movement of one extent in machine cycles wherein said control mechanism is in operative and line spacing movement of a different extent in machine cycles wherein said control mechanism is operative.

17. In a record controlled machine of the class described having an operating station for supporting sheet material in working relation to certain machine members operable thereon and having control mechanism operable only in certain machine cycles, means for spacing a primary form sheet past said operating station, said means including a primary sheet impelling mechanism and means under machine control for driving said impelling mechanism, a secondary sheet impelling mechanism for advancing a secondary sheet past said operating station, a line space actuator reciprocable each machine cycle, means geared to said secondary impelling mechanism and engageable by said actuator for operating said secondary impelling mechanism, a disabling member for said actuator disposed when effective to prevent reciprocation of said actuator, means associated with said primary sheet driving mechanism and effective, when said drive mechanism is operated, to render said disabling member ineffective, a member disposed to limit the operative stroke of said actuator, said member being shiftable from an effective to ineffective limiting relation to said actuator and having means, when in ineffective relation to said actuator, for rendering said disabling member ineffective, and means operated by said control mechanism to shift said limiting member to said ineffective position, whereby said secondary line space actuator may be controlled to space said secondary form sheet varying extents and in machine cycles wherein said primary form feeding mechanism is inoperative.

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