Nov. 13, 1962 E. M. SPRINGER 3,063,711

PRESSURE CONTROL FOR SHEET FEED MEANS IN DUPLICATING MACHINE

Filed Feb. 26, 1959 4 Sheets-Sheet 1

Fig. 1.

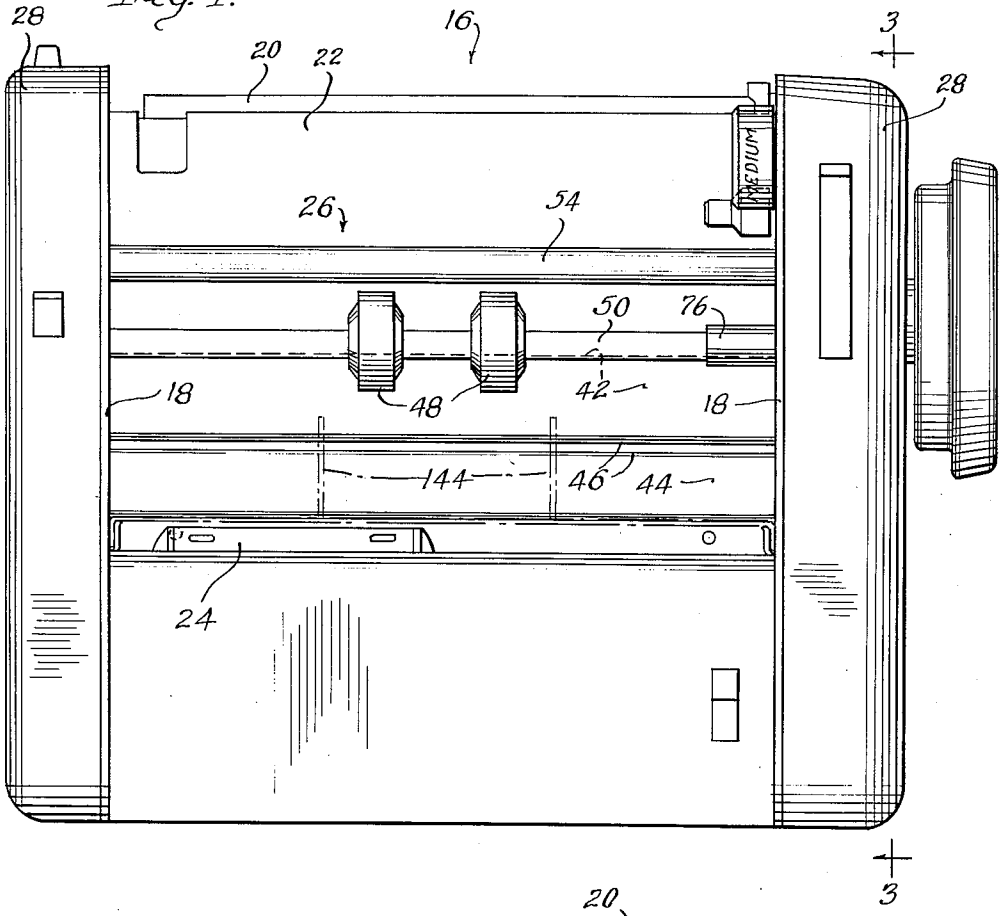
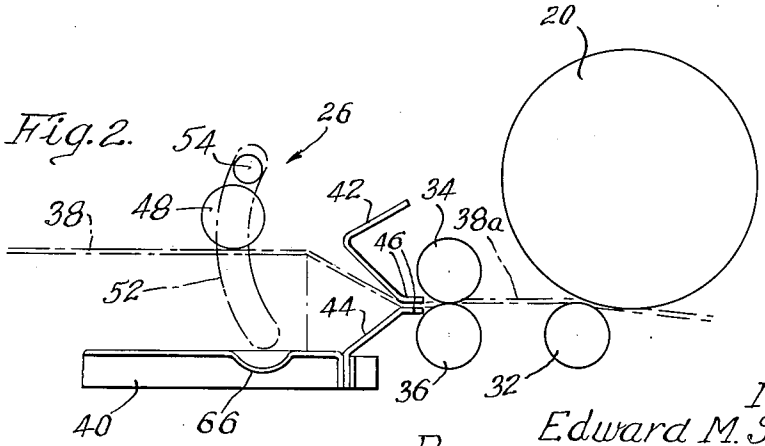


Fig. 2.



Inventor:
Edward M. Springer
By Hoxton, Dann,
Brewer & Brugman
Attys

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Filed Feb. 26, 1959 4 Sheets-Sheet 2

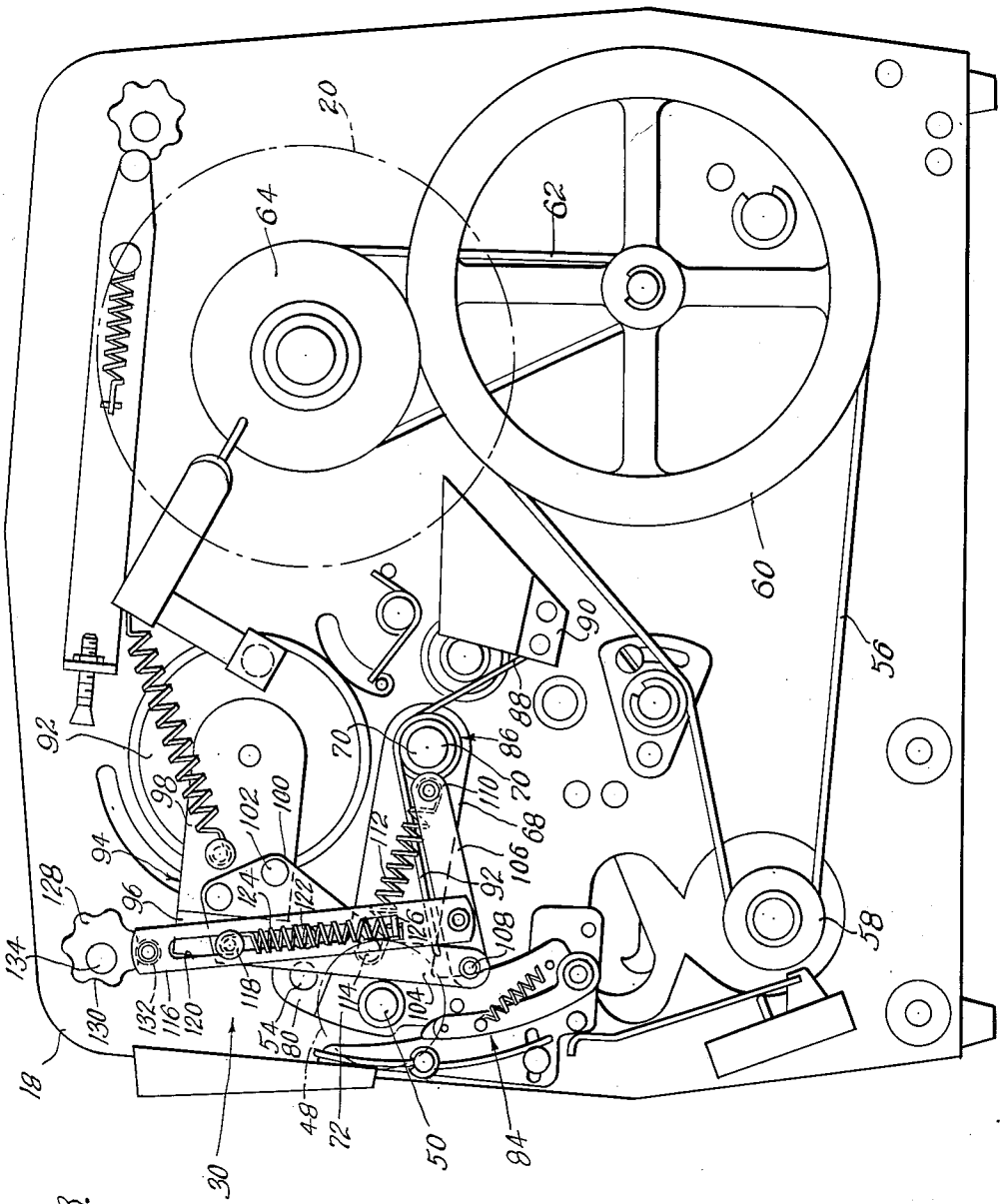


Fig. 3.

Inventor
Edward M. Springer
By Horton, Davis
Brewer + Brueman
Attys

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PRESSURE CONTROL FOR SHEET FEED MEANS IN DUPLICATING MACHINE

Filed Feb. 26, 1959 4 Sheets-Sheet 3

Fig. 5.

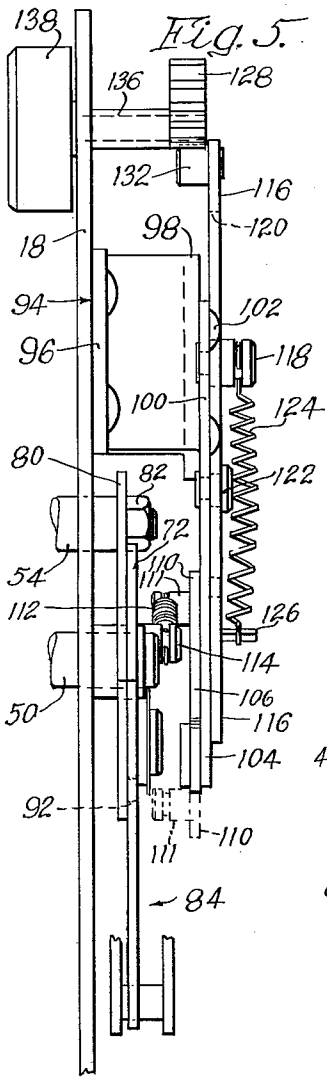
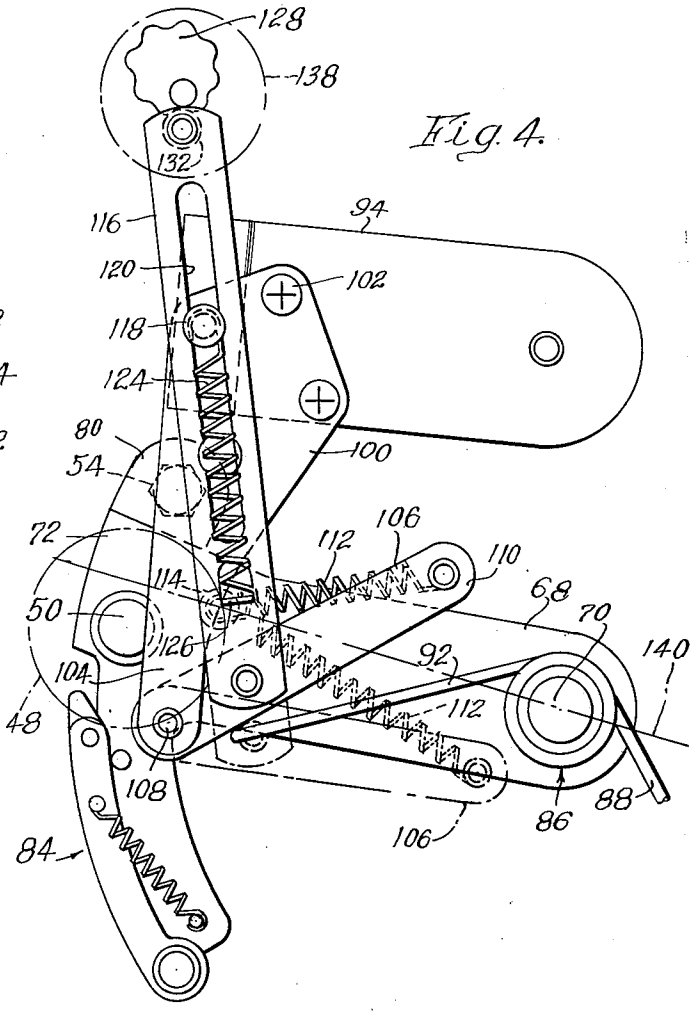


Fig. 4.



Inventor:
Edward M. Springer
By Horton, Davis, Brewer & Bergman
Attys

Nov. 13, 1962 E. M. SPRINGER 3,063,711

PRESSURE CONTROL FOR SHEET FEED MEANS IN DUPLICATING MACHINE

Filed Feb. 26, 1959 4 Sheets-Sheet 4

Fig. 6.

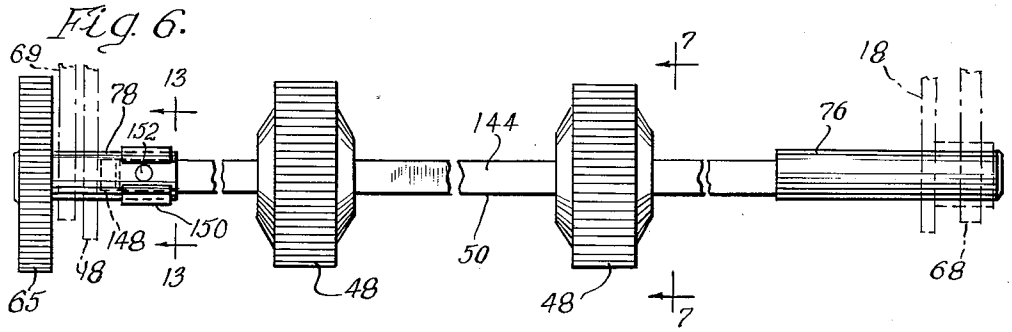


Fig. 10.

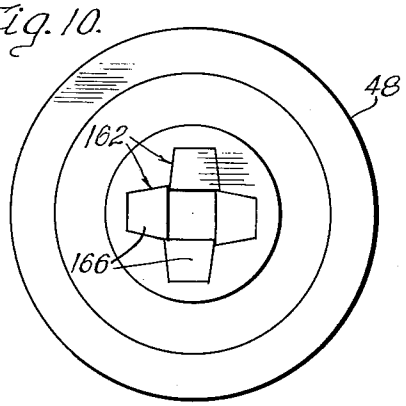


Fig. 7.

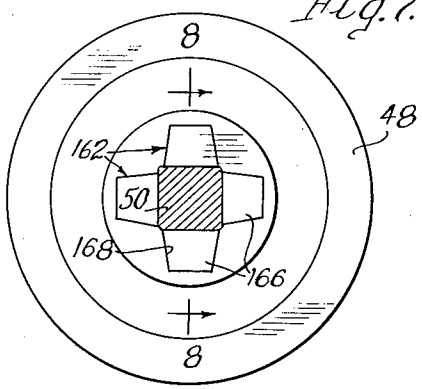


Fig. 11.

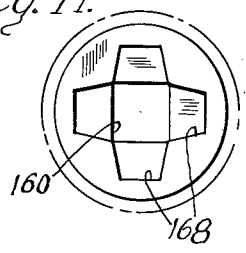
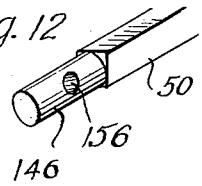


Fig. 12



9

Fig. 8.

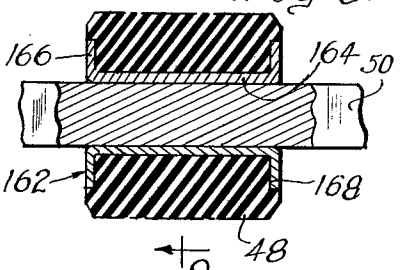


Fig. 9.

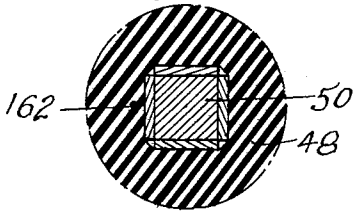
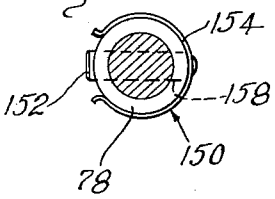


Fig. 13.



Inventor:
Edward M. Springer
By Hoelton, Davis,
Brewer & Bergman
Attys

United States Patent Office

3,063,711

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3,063,711

PRESSURE CONTROL FOR SHEET FEED MEANS IN DUPLICATING MACHINE

Edward M. Springer, Chicago, Ill., assignor, by mesne assignments, to Heyer Inc., Chicago, Ill., a corporation of New York

Filed Feb. 26, 1959, Ser. No. 795,747

7 Claims. (Cl. 271—36)

The present invention relates to duplicating machines and more particularly to control for feed means utilized for feeding copy sheets from the usual feed table into the duplicating machine.

In duplicating machines generally, a stack of copy sheets is placed on a feed table mounted in the duplicating machine, and the sheets are fed from the stack, singly, to the machine. Means is included for feeding the sheets, while means is also utilized for controlling the stack of sheets so that only the single top sheet is fed at a time and the remaining sheets are held against removal.

In mechanisms of this general kind, the feeding means is arranged for imposing a certain predetermined friction pressure on the top copy sheet, which is of course necessary in order to remove that copy sheet. For best results, the pressure exerted by the feeding means should be varied according to the weight or thickness of the copy sheets being used. For example, greater pressure should be used in the case of heavy copy sheets than in the case of lighter or thinner sheets, since a given pressure for heavy sheets may result in more than one light sheet being fed at a time, while on the other hand, a pressure set for light sheets may not effect feeding of heavy sheets at all. Heretofore, there has not been an entirely satisfactory means for varying the pressure of the feeding means of the general type involved.

An object therefore of the invention is to provide novel means for varying the pressure of the feeding means of the character above referred to, in a duplicating machine.

Another object is to provide means of the foregoing character that is capable of varying the pressure of the feeding means throughout a range from a positive pressure to a negative pressure.

Still another object is to provide means of the foregoing general character that may be adjusted for varying the pressure while the duplicating machine is in operation.

A further object is to provide pressure controlling means of the general character above referred to which is of extremely simple construction.

Another and more specific object is to provide pressure controlling means of the foregoing general character that utilizes a novel over-center spring-controlled arrangement for producing the positive and negative pressures in the feeding means.

A still further object is to provide novel feed wheels for gripping the top copy sheet of the stack and feeding it to the duplicating machine, and a shaft for demountably supporting the feed wheels and for supporting them for adjustment therealong.

Other objects and advantages of the invention will appear from the following detailed description taken in conjunction with the accompanying drawings in which—

FIGURE 1 is a frot elevational view of a duplicating machine embodying the features of the present invention;

FIGURE 2 is a diagrammatic view of a portion of the interior of the duplicating machine, orientated in a vertical fore-and-aft direction, showing certain of the essential operating members of the machine;

FIGURE 3 is a side elevational view of the machine taken on line 3—3 of FIGURE 1, but with the side housing member removed and showing pressure control means of the invention;

FIGURE 4 is a large scale view of the pressure control means included in FIGURE 3;

FIGURE 5 is a view from the left of FIGURE 4 and additionally including a side plate of the machine on which the other elements are mounted;

FIGURE 6 is a front elevational view of the feed wheels and shaft shown in FIGURE 1;

FIGURE 7 is a view taken on line 7—7 of FIGURE 6;

FIGURE 8 is a sectional view taken on line 8—8 of FIGURE 7;

FIGURE 9 is a sectional view taken on line 9—9 of FIGURE 8;

FIGURE 10 is a view similar to FIGURE 7 but with the mounting shaft omitted;

FIGURE 11 is a view oriented according to FIGURE 10, but showing only the central portion of the wheel and with the insert elements omitted;

FIGURE 12 is a perspective view of a portion of one end of the shaft on which the feed wheels are mounted; and

FIGURE 13 is a sectional view taken on line 13—13 of FIGURE 6.

Referring now in detail to the drawings, attention is directed first to FIGURES 1 to 3 for a representation of the duplicating machine as a whole in which the pressure control means of the present invention is incorporated. The particular kind of duplicating machine utilized for carrying out the objects of the invention is not an essential part of the invention except that the invention is applied to a kind of duplicating machine having means for feeding copy sheets from a feed table into the machine. The pressure control means of the invention controls the pressure applied by this feeding means on the copy sheets which are being fed into the machine. By way of example, the duplicating machine here illustrated is of the kind illustrated in full and claimed in my copending application Serial Number 661,460, filed May 24, 1957, now Patent No. 2,975,707, dated March 21, 1961.

Such duplicating machine is indicated at **16** and as illustrated in FIGURE 1 includes a pair of spaced-apart side plates **18** forming the main portion of a framwork for supporting the other parts of the machine. Mounted in and between the side plates are such instrumentalities as a drum **20**, a fluid tank **22**, a driving motor **24**, as well as feed means **26** forming a principal portion of the embodiment of the present invention.

Outwardly of and mounted on the side plates **18** are housing members **28** for enclosing certain operating parts mounted on the outer sides of the side plates. FIGURE 3 is a view from the right hand side of FIGURE 1 as indicated by the line 3—3 but with the respective housing member **28** removed and exposing the outer side of the corresponding side plate **18** and the operating parts thereon. The pressure control means forming the subject matter of the present invention includes as a principal part thereof certain linkage indicated in its entirety at **30** in FIGURE 3, this view showing its orientation with the other parts of the duplicating machine. It is shown in greater detail in FIGURES 4 and 5.

Referring again to the duplicatiing machine itself, attention is directed to FIGURE 2 which shows diagrammatically the main operating parts within the machine utilized for imprinting on the copy sheets as they are passed through the machine. In FIGURE 2, the drum **20** referred to above is shown, this drum being utilized for securing a master thereon in a suitable manner. Cooperating with the drum **20** is an impression roll **32**. Adjacent the drum and impression roll in anterior direction with respect to the direction of passage of copy sheets through the machine, is a pair of cooperating rolls which include a moistening roll **34** and pressure

roll **36**. A stack of copy sheets **38** is placed on a feed table **40** and are fed into the machine for passage between the rolls **34** and **36**, and thereafter between the drum **20** and roll **32**. The roll **34** is for the purpose of moistening each copy sheet as it passes thereby, and the two rolls **34** and **36** together grip the copy sheet therebetween and feed it to the drum **20** and roll **22**. Thereafter, rotation of the drum **20** and roll **32** feeds the copy sheet therebetween and subsequent to making an impression thereon from the master on the drum, the copy sheet is discharged into a suitable receiving tray (not shown).

The copy sheets **38** on the feed table upon being fed successively therefrom into the machine, are guided into proper relation to the rolls **34** and **36** by means of deflectors **42** and **44** extending transversely across the machine and forming a concave receiving and deflecting zone operative for guiding the leading edges of the copy sheets between terminal portions **46** of the deflectors which are positioned for guiding the sheets to the bight of the rolls **34** and **36**.

The feed means **26** referred to above, includes a pair of feed wheels **48** mounted on a rotatable shaft **50** which extends through arcuate slots **52** (FIGURE 2) in the side plates **18** for up and down movements therein. Associated with the feed wheels **48** and shaft **50** is a bar **54** positioned above the shaft and secured in a rigidly assembly therewith, serving as a means for grasping by the hand for lifting the feed wheels. Upon rotation of the feed wheels **48** in appropriate direction (counterclockwise as viewed in FIGURES 2 and 3), the top copy sheet **38** is frictionally gripped thereby and fed from the top of the stack into the machine as indicated by the single copy sheet designated **38***a*.

Rotation of the feed wheels **48**, as well as movement of other moving parts of the duplicating machine including the roll **34** and drum **20** which are positively driven, is effected by the motor **24** and suitable drive transmission means, a portion of which is shown in FIGURE 3 and all of which are disclosed in detail in the above-mentioned copending application. The portions of the drive transmission means shown herein include a belt **56** connected between a pulley **58** on the drive shaft of the motor and a pulley **60** mounted on the adjacent side plate **18**. Another belt **62** is trained on a pulley on the shaft bearing pulley **60** and a pulley **64** on the shaft on which the drum **20** is mounted. Also provided is drive transmission means between the drum **20** and the shaft **50** on which the feed wheels are mounted. This latter drive transmission means is on the side of the machine opposite that shown in FIGURE 3 or on the left hand side as viewed in FIGURE 1; it terminates in a gear **65** (FIG. 6) having connection with the shaft **50**, as brought out in detail hereinbelow.

The assembly including the shaft **50** and bar **54**, in the operation of the machine, is adapted to be lowered by gravity, the feed wheels **48** resting on the top copy sheet of the stack. This position is shown in FIGURE 2. As the stack is depleted the assembly lowers with the feed wheels constantly bearing on the stack and engaging the top sheet thereof. Upon removal of the last copy sheet from the feed table the feed wheels drop into a trough or groove **66** formed in the feed table **40**. In loading copy sheets in the machine in normal use thereof, the operator grasps the bar **54** and lifts the assembly including that bar and the shaft **50** to an uppermost position in which the bar engages the upper edge of the slots **52**. The assembly is latched in such position as disclosed fully in the above mentioned patent, and while in that position a stack of copy sheets is placed on the feed table in the position shown in FIGURE 2; thereafter the assembly is released and let down on the stack to the position shown in FIGURE 2 in which the feed wheels engage and rest on the stack. Further details of the operation of these feed wheels will be referred to again hereinbelow in connection with the pressure control means.

The assembly including the shaft **50** with the feed wheels thereon and the bar **54** is mounted for its up and down movements on pivoted arms on opposite sides of the machine, one of these arms being shown at **68** in FIGURES 3 and 6 and the other at **69** in FIGURE 6. The arms are positioned on the outer sides of the respective side plates **18**. It will be understood that these arms are mounted on a common horizontal transverse axis contained in the pin or stud **70** on which the arm **68** is pivotally mounted. The shaft **50** is mounted at one end in the swinging end of the arm **68** indicated at **72**, in an arrangement which may include a bushing or bearing **74** secured in the end of the arm and in which a cylindrical portion **76** of the shaft is rotatably mounted. The opposite end of the shaft may be mounted by means illustrated in FIGURE 6 which includes a hub portion **78** of the gear **65**. The details of this mounting means will be given hereinbelow, it being sufficient to state at the present point that upon rotation of the gear **65** the shaft **50** is rotated.

The swinging end portion **72** of the arm **68** has an upstanding extension **80** in which the adjacent end of the bar **54** is mounted. This mounting may assume any practical form such as that shown in FIGURE 5 where the bar has a reduced terminal portion projected through an aperture in the extension **80** and secured by a nut **82**. The arm **68** also had a downwardly extending part **84**, including certain operating parts brought out in detail in the above mentioned copending application but which do not enter into the present invention and are not described in detail herein, this part being omitted at least partially from FIGURE 5.

Means is provided for biasing the arm **68**, and thus the feed wheels **48**, upwardly so as to partially counterbalance the action of gravity thereon. This means may be in a form of wire spring **86** having a central coiled portion on the stud **70**, one end portion **88** engaging a fixed element **90** on the frame of the machine, and another end portion **92** engaging under the arm **68** adjacent the swinging end of the latter. The pressure control means indicated at **30** is arranged to operate on the arm **68**, and acting through this arm and the shaft **50** it controls the pressure exerted by the feed wheels **48** on the stack of copy sheets. This pressure control means is mounted bodily on a suitable member of the frame structure of the machine such as bracket **94** which is utilized for supporting one end of the fuel supply tank **22**. This bracket **94** has one end portion **96** secured to the respective side plate **18** as best shown in FIGURE 5, and another portion **98** spaced outwardly therefrom. The pressure control means includes a mounting member indicated in its entirety at **100** secured rigidly to the portion **98** of the bracket **94** by suitable means such as screws **102**. This member has a downwardly extending leg terminating at a level adjacent to that of the pivot axis of the arm **68**. An adjusting lever **106** is pivoted at one end at **108** on the lower end of the leg **104** on a horizontal transverse axis and its opposite swinging end **110** is disposed adjacent the stud **70**. A tension spring **112** is interconnected between the swinging end of the adjusting lever **106** and a pin **114** fixedly secured to the arm **68** adjacent the swinging end of the latter.

A control link **116** is mounted on the mounting member **100** for sliding movements in a generally vertical direction or such direction that upon sliding thereof the adjusting member **106** is swung in generally up and down movements. The connection for enabling such sliding movement includes a stud **118** fixedly mounted on the member **100** adjacent the top thereof and fitted in a longitudinal slot **120** in the link **116**. A smaller stud or rivet **122** is also secured to the member **100** and extended through the slot **120**. The elements **118** and **122** provide suitable guiding movements for maintaining the link **116** in properly aligned longitudinal direction. The stud **118** provides a connecting means for one end of a tension spring **124** for biasing the link **116** upwardly, the opposite

end of the spring being connected to a tab **126** on the link.

Manual adjustment of the link **116** is provided by means of a cam **128** having a plurality of depressions **130** adapted to selectively receive a roller or cam follower **132** on the upper end of the link. The cam or eccentric **128** is mounted on the outer end of the shaft **134** mounted in the adjacent side plate **18**, a spacer **136** being interposed between the cam and the side plate. A manual control knob **138** is mounted on the inner end of the shaft, on the inner side of the side plate, positioned for convenient grasping by the hand for manual manipulations. The cam or eccentric **128** upon rotation thereof to different positions is operative for positioning the link **116** in corresponding positions, according to which of the depressions **130**, and corresponding distances from the axis of rotation, the cam follower is positioned. The control knob **138** may be provided with appropriate inscriptions as in FIGURE 1 for indicating the pressure imposed on the feed wheels according to the respective setting of the pressure control means.

The pressure control means **30** is operative for imposing various pressures on the feed wheels **48**, which may be positive or negative pressures, i.e. positive pressure or downward pressure added to the effect of gravity on the feed wheels, and negative pressure or upward pressure counter to the effect of gravity. Referring more particularly to FIGURE 4, where the arm **68** is in an upper position, a reference line **140** is shown drawn through the pivot axis of the arm **68** and the pin **114**. The adjusting lever **106** is also in an upper position corresponding to an upper position of the sliding link **116** as controlled by the position of the cam **128**. In this position of the lever **106** the swinging end thereof is above the reference line **140** and therefore produces an upwardly biasing effect or negative pressure on the arm **68**. The adjusting lever **106** is swingable to a lower position indicating in dot-dash lines in FIGURE 4 where the swinging end of the lever is below the reference line **140**. In this position the tension spring **112** produces a downwardly biasing effect or positive pressure on the arm **68**. It will be understood that the lever **106** may assume any of a plurality of positions between its uppermost and lowermost positions. The swinging end of the adjusting member **106** is horizontally adjacent the transverse pivotal axis of the arm **68**, an ideal position being in effective vertical alignment with that axis, but in the interest of compactness it is displaced slightly therefrom. The pivot axis of the control lever **106** at the lower end of the leg **104** is horizontally adjacent the path of movement of the shaft **50**, to the end of providing substantial length to the lever **106** and consequent substantial throw thereof, for exerting corresponding pressure on the feed wheels. Adjustments of the pressure control means may be made easily and simply, even while the machine is in operation by adjusting the knob **138**.

The feed wheels **48** are preferably two in number and for best effect they should engage the copy sheets adjacent the side edges thereof. A feed table of a kind well adapted for use in connection with the present invention and as disclosed in detail in my copending application Serial Number 795,699, filed February 26, 1959, includes adjustable side guides **144** (FIG. 1) for engaging the side edges of the copy sheets placed on the feed table. These side guides are adjustable transversely of the feed table and in order to provide for the desired position of the feed wheels as indicated above, the latter are made adjustable along the shaft **50** by means of a novel construction embodied in the present invention. The positioning of the feed wheels **48** in relation to the width of the particular size of copy sheets being used has certain relation with the degree of pressure imposed on the feed wheels under the control of the pressure control means **30**. The copy sheets are normally engaged at side edges by sheet release control means for restraining all but the top copy sheet from being fed from the feed table, in a single feeding operation. As mentioned above, the pressure applied to the copy sheets according to the present invention is selected according to the weight or thickness of the copy sheets since a greater pressure intended for a heavy copy sheet may cause feeding of more than one light copy sheet at a time, while a lesser pressure intended for light copy sheets may be ineffective for feeding a heavier sheet. In addition to providing the desired selected pressure, for best results in feeding, the feed wheels **48** should engage the copy sheets adjacent the side edges thereof or at locations transversely adjacent the means for controlling the release of the copy sheets. Accordingly, the sheet wheels **48** are made adjustable along the shaft **50**, as stated, by novel means shown in detail in FIGURES 6 to 13, inclusive, disclosed and claimed in copending divisional application Serial No. 186,476, filed April 10, 1962.

The shaft **50** includes the cylindrical portion **76** referred to above and the main central portion indicated at **144** is polygonal, and preferably square, in cross section. The cylindrical portion **76** may be larger than the greatest cross sectional dimension of the square portion **144**; at the opposite end is another cylindrical portion **146** which is no greater than the side-to-side cross sectional dimension of the portion **144**, and preferably is substantially equal thereto. This cylindrical portion **146** forms a means for mounting that end of the shaft in the hub member **78**, as well as to facilitate insertion of that end of the shaft into the central holes of the feed wheels, the feed wheels being removable from the shaft as described hereinbelow. The cylindrical portion **146** is fitted in axial bore **148** in the hub member **78** and is held therein against axial displacement by means of a removable securing means **150** which includes a pin **152** secured at the central portion of a clip **154**. The clip **154** is of spring material and has side arms of arcuate shape releasably engaging around the hub member **78** with the pin **152** projected through a transverse hole **156** in the end of the shaft and aligned holes **158** in the hub member **78**. Removal of the securing means **150** may be effected by flexing the side arm portions of the clip **154** outwardly and removing it from the hub member, withdrawing the pin **152** from the holes **156** and **158**. The shaft is permitted axial movement in the arm **68** to remove the cylindrical portion **176** from the hub member **78**.

The feed wheels **48** are preferably of rubber or rubber-like material for providing a high degree of friction with the copy sheets for assuring removal of the copy sheets from the stack. If desired the peripheral surface of the feed wheels **48** may be ribbed or serrated for increasing their friction with the copy sheets. The feed wheels may be of any desired size and proportions and each has a central axial hole **160** therethrough (FIGURE 11) of polygonal shape corresponding to that of the portion **144** of the shaft, or square. The hole is also similar in transverse dimensions to the square portion of the shaft, but the material of the feed wheels is highly resilient and at any given time this hole may be stretched to a size greater than that of the shaft, and it is so stretched by the inserts **162** which are placed in the wheels and interposed between the side surfaces of the holes and the shaft. These inserts **162** are preferably steel strips having a central elongated portion **164** and an end portion **166** at each end turned transversely to the main portion; these end portions may be slightly tapered as indicated in FIGURES 7, 10 and 11. These inserts are placed in the hole in the wheel with the central elongated portion **164** extending axially and fitted flat to the corresponding side surfaces of the hole with the end portions **166** engaging the side surfaces of the wheel and directed radially outwardly. Preferably, the side surfaces of the wheel are provided with recesses or cavities **168** as shown in FIGURES 8 and 11 of suitable dimensions for snugly receiving these end portions **166** and establishing an outer flush surface con-

taining the surfaces of the wheel and the outer surfaces of the end portions.

These inserts may be of a width similar to or slightly greater than the transverse edge dimension of the hole in contracted condition of the wheel and when inserted in the hole with the wheel off of the shaft in the position indicated in FIGURE 10, the edges of each insert may be lapped with the edge of adjacent insert, in one direction. The wheel is placed on the shaft by inserting the small cylindrical portion **146** into the hole defined by the inserts. The cylindrical shape **146** facilitates insertion of the end of the shaft into the hole, enabling cocking or canting positions of the shaft and wedging the inserts outwardly as the cylindrical portion is forced into the hole. The diameter of the shaft portion **146** being substantially equivalent to side-to-side dimension of the square portion of the shaft, forces the inserts radially outwardly and positions them so as to facilitate insertion of the square portion into the hole. Upon outward expansion of the inserts the material of the wheel is expanded, or stretched outwardly to a position indicated in FIGURE 7. The relative relations and dimensions of FIGURES 7, 10 and 11 are slightly exaggerated for convenience in depicting the effect produced, the object being to show that the square portion of the shaft expands the material of the wheel substantially so that high friction engagement is established between the inserts and the shaft. The inserts and shaft being of rigid material enable the feed wheels to be slid along the shaft upon application of appropriate pressure as by the hand, as contrasted with the objectionable dragging effect produced between rubber and steel. However, the contracting effect of the resilient material of the wheel is sufficient to establish such high degree of friction between the inserts and shaft as to provide the necessary gripping effect to retain the feed wheels in set or adjusted position against ordinary forces involved in the use of the machine.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a duplicating machine having means for passing copy sheets therethrough and imprinting thereon in their passage therethrough, and means for supporting a stack of copy sheets at an entrance end of the machine, the combination comprising, feed wheels, means supporting the feed wheels including at least one arm connected at a vertically swinging end with the feed wheels, and pivoted at its other end on a transverse axis, the feed wheels being adapted to descend by gravity, an adjusting lever pivoted at one end adjacent the path of vertical movement of the feed wheels at a height substantially equivalent to that of said transverse axis of the arm and itself being pivoted on a tranverse axis and having a vertically swinging end horizontally adjacent the pivot axis of said arm, a tension spring connected between the swinging ends of said arm and lever, a link slidably mounted and connected with said lever between the ends of the latter and operative in response to sliding movement for swinging the arm, manually actuatable cam means for sliding the link in one direction and adjustably setting it in any of a plurality of positions corresponding to positions of the swinging end of the adjusting lever in a range from above to below the pivot axis of said arm, and spring means for biasing the lever in the opposite direction.

2. In a duplicating machine having means for passing copy sheets therethrough and imprinting thereon in their passage therethrough, and means for supporting a stack of copy sheets at an entrance end of the machine for feeding of them therefrom into the machine, the combination comprising, feed means mounted in the machine and frictionally engageable with the top one of a stack of copy sheets on said supporting means for feeding it therefrom into the machine, arms mounting said feed means at one end of the arms for generally vertical swinging movements about a transverse pivot axis at the other end of the arms and spaced generally horizontally from the feed means, said feed means being constantly subject to lowering by gravity, adjusting arms pivoted on a transverse axis adjacent the line of movement of the free ends of the mounting arms, and extending generally horizontally with their free ends swingable generally vertically in lines adjacent the first pivot axis, tension spring means interconnecting the free ends of the adjusting arms and the free ends of the mounting arms and operative for producing a constant bias on the mounting arms, and manually actuatable means for adjustably setting the adjusting arms in any of a plurality of positions in a range at one end of which the free ends of the adjusting arms are above the axis of the mounting arms and at the other end of which they are below the last named axis.

3. The invention set out in claim 2 in which non-yielding stop means is provided for limiting the upward movement of the adjusting arms, and spring means is provided for biasing the adjusting arms upwardly.

4. The invention set out in claim 3 in which said stop means includes a manually settable cam having a plurality of positions for selectively predetermining the positions of said adjusting arms throughout their said range.

5. The invention set out in claim 1 in which the feed means includes a pair of feed wheels on a rotatable shaft, and the feed means is constantly subject to gravity and free to lower thereby as determined by the depth of the stack of sheets and throughout the range of the stack.

6. The combination set out in claim 5 in which the feed wheels are adjustable along said shaft throughout substantially the full width of the sheet supporting means whereby to provide for engaging copy sheets of different widths by the feed wheels at similar and corresponding positions.

7. The invention set out in claim 6 in which means is included for detachably mounting said shaft, and said feed wheels are removable from the shaft over the ends thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,264,053	Garner	Apr. 23, 1918
2,042,131	Spiess	May 26, 1936
2,359,856	Morse	Oct. 10, 1944
2,585,873	Stephenson	Feb. 12, 1952
2,689,395	Kupfer	Sep. 21, 1954
2,890,517	Mengel	June 16, 1959