Dec. 19, 1967 T. GASSINO ETAL 3,358,918

PAPER FEED MECHANISM FOR A PRINTING CALCULATING OR LIKE MACHINE

Filed April 11, 1966 2 Sheets-Sheet 1

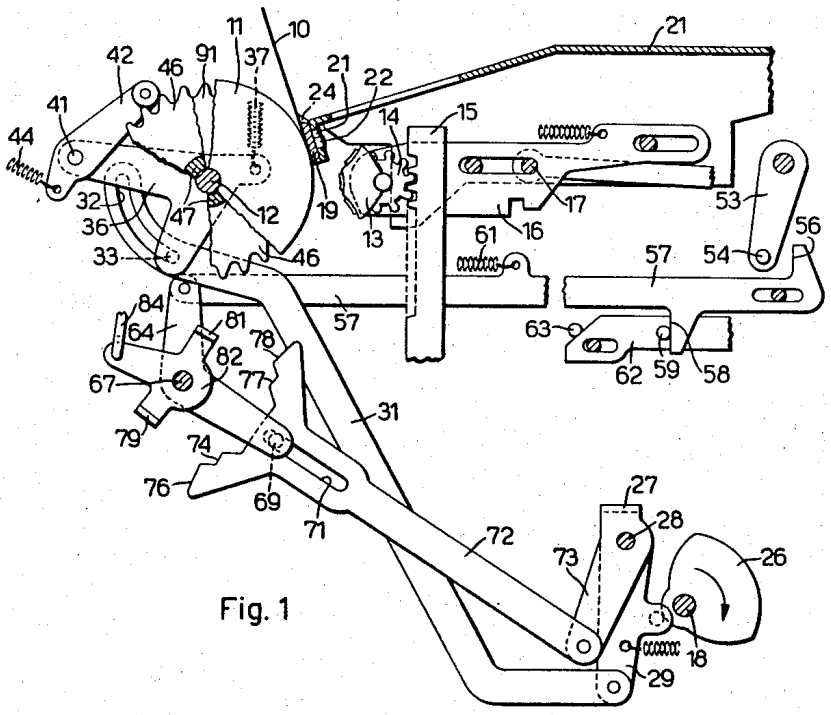

Fig. 1

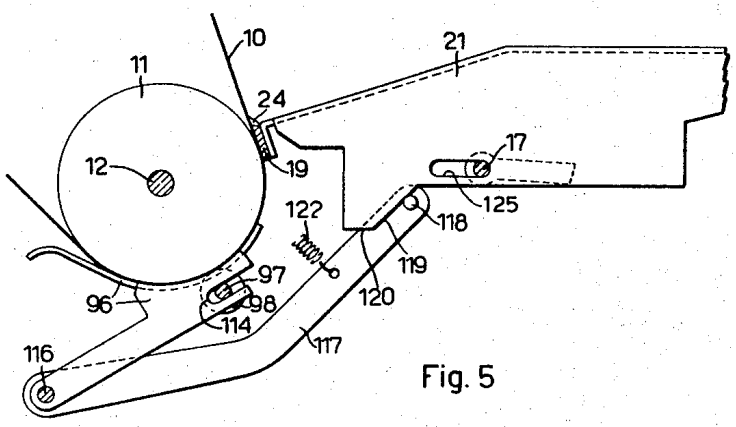

Fig. 5

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PAPER FEED MECHANISM FOR A PRINTING CALCULATING OR LIKE MACHINE

Filed April 11, 1966 2 Sheets-Sheet 2

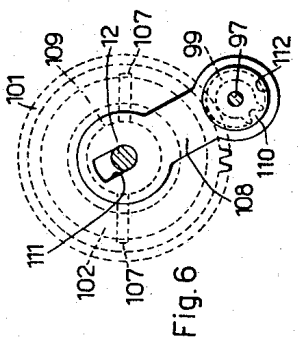

Fig. 6

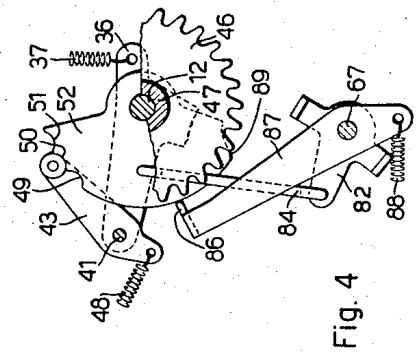

Fig. 4

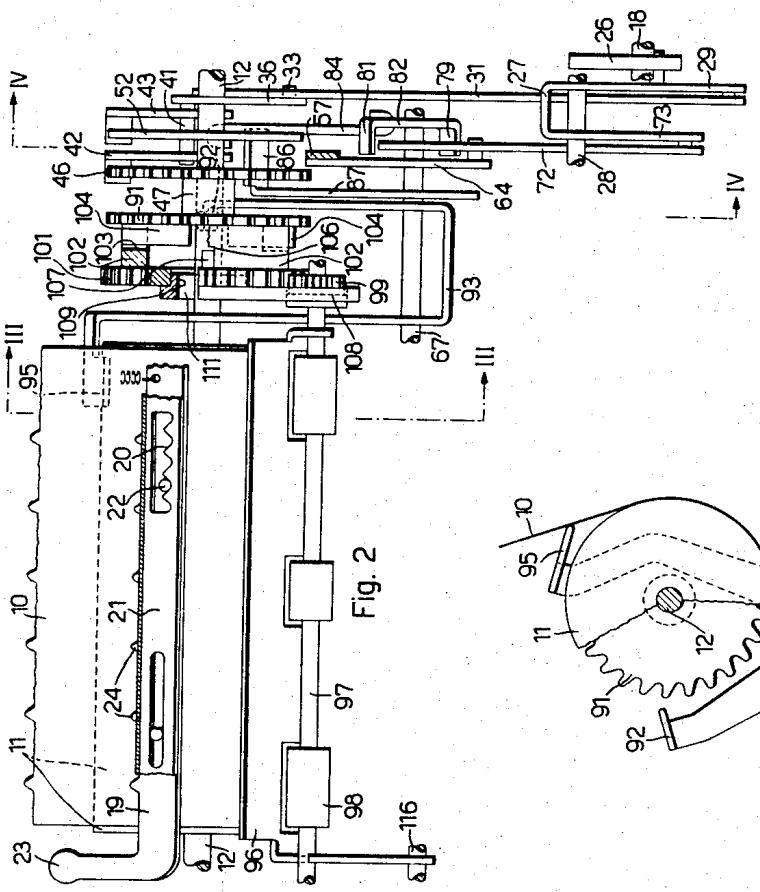

Fig. 2

Fig. 3

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United States Patent Office 3,358,918
Patented Dec. 19, 1967

3,358,918

PAPER FEED MECHANISM FOR A PRINTING CALCULATING OR LIKE MACHINE

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Filed Apr. 11, 1966, Ser. No. 541,625
Claims priority, application Italy, Apr. 10, 1965, 8,943/65
6 Claims. (Cl. 235—60.51)

ABSTRACT OF THE DISCLOSURE

A paper feed mechanism for a printing machine comprises a platen rotated before the printing in one direction retracting said paper to a printing position and rotated after the printing in the opposite direction advancing the paper to a reading position. The platen is secured to a ratchet wheel engaged by a spring urged locking member reciprocable to rotate the platen. An intercepting member arrests the ratchet wheel after being rotated to the printing position while the locking member continues its stroke at least one line farther. After printing, the intercepting member releases the ratchet wheel, and the locking member rotates the platen in the opposite direction advancing the last printed line to the reading position.

This invention relates to a paper feed mechanism for a printing calculating or like machine, comprising a platen adapted to be rotated before the printing in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces and a ratchet wheel bodily rotatable with said platen and normally locked by a spring urged locking member.

There are known paper feed mechanisms of this type, wherein the last printed line is brought automatically above the upper edge of the conventional tearing ruler. The purpose of these mechanisms is to retract and then to advance said paper so that the amounts printed on the tape are clearly visible after each operation of the machine and so that the paper may be cut by said tearing ruler directly in the reached position without interfering with the legibility of the printed amounts. All these known mechanisms are provided with different means for rotating the platen in the two directions, whereby the mechanisms are relatively intricate.

This disadvantage is obviated by the paper feed mechanism according to the invention, which is characterized by cyclically operating means for moving said locking member through a predetermined forward stroke before the printing, said locking member being adapted to rotate yieldably said ratchet wheel in said predetermined direction, an intercepting member being provided for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, while said locking member completes said forward stroke independently from said ratchet wheel, restoring means being effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space.

This and other characteristics of the invention will become apparent from the following detailed description of a preferred embodiment thereof, and from the accompanying drawings wherein:

FIG. 1 is a left hand longitudinal partial sectional view of a paper feed mechanism according to the invention embodied in a printing calculating machine;

FIG. 2 is a partial front view of the mechanism;

FIG. 3 is a left hand longitudinal sectional view taken according to the line III—III of FIG. 2;

FIG. 4 is a left hand longitudinal sectional view taken according to the line IV—IV of FIG. 2;

FIG. 5 is a left hand longitudinal view of a detail of the mechanism;

FIG. 6 is a longitudinal view of another detail of the mechanism.

With reference to FIG. 1, the numeral **11** indicates a conventional platen **11** secured to a shaft **12** rotatably mounted on the machine frame and adapted to support a paper strip **10**. A printing device comprising a set of slides **16**, each one carrying a typewheel **13**, is adapted to print simultaneously on the paper **10** under the control of a universal bar **17** reciprocated in a known manner by a cyclically rotating shaft **18**, which represents the main shaft of the machine. Secured to each typewheel **13** is a pinion **14** steadily engaged by a vertical rack **15**, the movement of which is controlled by a corresponding actuator not shown in the drawings.

In the rest position the printed amount is visible above the upper edge of a tearing ruler **19** (FIG. 2) having a pin **22** cooperating with a toothed slot **20** provided on the paper release frame **21** and adapted to be transversely displaced by manually operating a lug **23** integral with the ruler **19**. The upper edge of the ruler **19** is provided with a set of projections **24** adapted to provide the cut edge of the paper with a set of notches. The projections **24** are distanced according to three typewheels **13** to facilitate the reading of the printed amount by subdividing the same in groups of orders.

Secured to the shaft **18** is a cam **26** (FIG. 1) adapted to cooperate with a bail **27** fulcrumed on a stationary shaft **28**. Linked with an arm **29** of the bail **27** is a link **31**, which is provided with an arcuate slot **32** engaged by a pin **33** of a lever **36** rotatably mounted on the shaft **12**. The slot **32** has a predetermined length corresponding, for instance, to five line spaces. At rest the lever **36** is urged by a spring **37** to cause the pin **33** to contact the lower edge of said slot **32** as shown in FIG. 1. Furthermore, secured to the lever **36** is a pivot **41**, pivotally mounting a locking member **42** which is urged by a spring **44** to engage a ratchet wheel **46** intergral with a sleeve **47** secured to the shaft **12**. The teeth of the wheel **46** have a pitch corresponding to a line space.

Fulcrumed on the pivot **41** is also a second locking member **43** (FIG. 4) urged by a spring **48** to engage one of three notches **49**, **50**, **51** provided on a cam shaped sector **52** idly mounted on the shaft **12**. Normally, the member **43** engages the intermediate notch **50** as shown in FIG. 4.

A lever **53** (FIG. 1) is adapted to be manually or automatically located in one of a pair of positions according to the character of the operation of the machine, i.e. whether it is a printing cycle or a non-printing cycle, in a known manner and is provided with a pin **54** adapted to cooperate with a shoulder **56** of a slide **57**.

Normally in the printing cycles, the lever **53** is located in the position shown in FIG. 1, and therefore the pin **54** does not engage the shoulder **56**. A spring **61** urges the slide **57** to contact with a shoulder **58** a pin **59** secured on a slide **62**. In the calculating printing cycles a pin **63** locates the slide **62** in the position of FIG. 1, whereas in the total taking printing cycles the pin **63** is displaced rearwards in a known manner to cause the slides **62** and **57** to be moved rearwards.

The slide **57** is linked with a lever **64** fulcrumed on a stationary shaft **67** and is provided with a pin **69** engaging a slot **71** provided on a forked slide **72**. The slide **72** is fulcrumed on an arm **73** of the bail **27**, and is also pro-

vided with four shoulders **74**, **76** and **77**, **78** two by two symmetrically located with respect to the stationary shaft **67**. The shoulders **74**, **76**, and the shoulders **77**, **78** respectively, are adapted to cooperate with a pair of lugs **79** and **81** of a lever **82** fulcrumed on the stationary shaft **67**. Furthermore the lever **82** is connected through a rod **84** (FIG. 4) to the sector **52**.

The paper feed mechanism comprises an intercepting lever **87** fulcrumed on the shaft **67** and having a bent lug **86** and urged by a spring **88** to contact the sector **52**. The bent lug **86** is normally located at a distance from a slope **89** of the sector **52** corresponding to four line spaces.

Fulcrumed on the shaft **67** is also a bail **93** (FIG. 3) having a first lug **92** adapted to cooperate with a ratchet wheel **91** similar to the wheel **46** and integral with the sleeve **47**, so that both the wheels **46** and **91** are bodily rotatable with the shaft **12**. Furthermore the bail **93** is provided with a second bent lug **95** urged by a spring **94** to sense the paper **10** above the upper edge of the tearing ruler **19**.

The paper **10** may be introduced into a conventional paper-guide frame **96** (FIG. 5) secured to a shaft **116** rotatably mounted on the machine frame. Secured to the shaft **116** is also a lever **117** having a pin **118** urged by a spring **122** to contact a cam shaped edge of the frame **21** comprising a tapered portion **119** and a horizontal portion **120**. The frame **96** is provided with a pair of notches engaging a shaft **97** secured to three paper feed rollers **98**. Secured to the shaft **97** is also a pinion **99** (FIG. 6) meshing with a pinion **101** provided with two radial opposite projections **107** (FIG. 2) engaging two corresponding notches **106** of a ring **102** also provided on the opposite side with two other notches **103** shifted 90 degrees with respect to the notches **106** engaged by two projections **104** of the wheel **91**. Thus the retracting and advancing rotation of the wheels **46** and **91** is transmitted to the pinions **101** and **99** through the ring **102**. The pinion **101** is rotatably mounted on a hub **109** integral with an arm **108** (FIG. 6) provided with a slot **111** entered by the shaft **12**. The arm **108** is also provided with a circular hole **112** entered by a circular disk **110** integral with the pinion **99**.

The paper feed mechanism operates as follows:

As already mentioned, during a calculating printing cycle, the lever **53** (FIG. 1), the slides **57** and **62** remain in the shown position and the lever **64** is not rocked. During the cycle of the main shaft **18**, the cam **26** rocks clockwise the bail **27**, thus displacing the link **31** and the slide **72** upwards, but the lugs **79** and **81** are not affected by the slide **72**. Therefore the sector **52** (FIG. 4) remains in the position shown on FIG. 4. In turn the link **31** (FIG. 1) rocks the lever **36** clockwise together with the rod **41**, whereby the two locking members **42** and **43** (FIG. 4) are rotated clockwise. The locking member **42** (FIG. 1) yieldably rotates the ratchet wheel **46** clockwise bodily with the sleeve **47** and the platen **11**, whereas the locking member **43** (FIG. 4) yieldably rotates the sector **52** clockwise.

When the sector **52** has been rotated four line spaces, the slope **89** of the sector **52** causes the lug **86** of the lever **87** to engage a tooth of the ratchet wheel **46**, thus locking the shaft **12**, the platen **11** and the paper **10** (FIG. 2) while the two locking members **42** and **43** and the sector **52** are rotated a further line space, the locking member **42** tripping a tooth on the wheel **46**. The paper **10** has been thus retracted four line spaces, while the locking member **42** completes its stroke of five line spaces, independently from the ratchet wheel **46**.

After the typewheels **13** (FIG. 1) print the set up amount on the paper **10**, the cam **26** causes the bail **27** to return counterclockwise. The link **31** and the slide **72** are restored and the lever **36** is restored by the spring **37** together with the locking members **42** and **43**. The locking member **42** now rotates the ratchet wheel **46**, the sleeve **47**, the platen **11** and the paper **10** five line spaces counterclockwise.

It is thus clear that the cyclically operating means **31**, **36**, are adapted to reciprocate the locking member **42** through a predetermined stroke to rotate yieldably the ratchet wheel **46** clockwise to retract the paper four line spaces, and then to advance same five line spaces and that the intercepting member **86** (FIG. 4) locks the ratchet wheel after being rotated said four line spaces in the retracting direction.

Now, supposing that a total key is depressed, the pin **63** (FIG. 1) is displaced rearwards, thus causing the spring **61** to displace the slides **57** and **62** rearwards, and to rock the lever **64** counterclockwise. Therefore, the pin **69** of the lever **64** rocks the slide **72** clockwise, whereby the shoulder **76** is located in front of the lug **79** of the lever **82**. When the bail **27** is rocked clockwise the shoulder **76** (FIG. 1) of the slide **72** encounters the lug **79** and rocks the lever **82** clockwise. The rod **84** thus rotates the sector **52** (FIG. 4) one line space clockwise with respect to the wheel **46**. Thus the locking member **43** is caused to engage the notch **49** of the sector **52**. Upon printing the total the paper **10** is advanced five line spaces as in the above case, while the sector **52** is returned also five line spaces and locates the slope **89** at a distance of three spaces from the lug **86**. At the end of the total taking cycle, the pin **63** (FIG. 1), the slides **62** and **57** are restored causing the lever **64** to return the slide **72** in the central position shown on FIG. 1.

If now a new calculating printing cycle is effected the sector **52** (FIG. 4) upon being rotated clockwise three line spaces causes the lug **86** to lock the wheel **46** and the platen **11**, while the locking member **42** trips two teeth on the wheel **46**. The shoulder **77** of the slide **72** (FIG. 1) encounters now the lug **81** of the lever **82**, which is thus returned in the position shown in FIG. 1. The lever **82** thus causes the sector **52** (FIG. 4) to rotate one line space counterclockwise with respect to the wheel **46**, whereby the locking member **43** engages again the notch **50**. Then the two locking members **42** and **43** (FIGS. 1 and 4) perform their return stroke for advancing the paper five line spaces and consequently the foregoing printed total and the new printed amounts are distanced two line spaces instead of one line space. The lug **66** contacts the sector **52** again at a distance of three line spaces from the slope **89**, thus predisposing one line space for the next printing cycle.

Supposing now that after a printing cycle, a non-printing cycle is effected. Then the lever **53** (FIG. 1) is rocked counterclockwise and through the pin **54** and the shoulder **56** displaces the slide **57** forwards, thus rocking the lever **64** clockwise. Consequently, the slide **72** is rocked counterclockwise and locates the shoulder **78** on the path of the lug **81** of the lever **82**. During the first part of this cycle the paper is retracted four line spaces and the shoulder **78** encounters the lug **81**, thus rocking the lever **82** counterclockwise and the sector **52** (FIG. 4) counterclockwise one line with respect to the locking member **43** which now engages the notch **51**. Then in the second part of this cycle the paper is advanced five line spaces, but the sector **52** locates the slope **89** at a distance of four line spaces from the lug **86**.

If then a calculating printing cycle is effected the lever **53** (FIG. 1), the slides **62** and **57**, the lever **64**, and the slide **72** are restored to the position shown on FIG. 1. In the first part of this calculating printing cycle the sector **52** (FIG. 4) is rotated clockwise, but the lug **86** of the intercepting lever **87** locks the platen **11** after five retracting line spaces, whereby the locking member trips no tooth on the wheel **46**. The shoulder **74** of the slide **72** (FIG. 1) encounters now the lug **79** of the lever **82** which is returned to the position shown on FIG. 1, thus rotating the sector **52** (FIG. 4) one line space clockwise with respect to the locking member **43** which engages again the notch **50**.

When the two locking members **42** and **43** (FIGS. 1 and 4) are returned counterclockwise, the paper is advanced five line spaces and consequently the new printed amount and the amount printed before the non-printing cycle are distanced one line space only. The lug **86** contacts again the sector **52** at a distance of three line spaces from the slope **89**, thus predisposing one line space for the next printing cycle.

Supposing now that a total taking cycle is requested after a non-printing cycle. During the retracting stroke of the paper, the shoulder **76** of the slide **72** encounters the lug **79** of the lever **82** which was rocked counterclockwise. The lever **82** is thus rotated clockwise, thus rocking the sector **52** clockwise two line spaces with respect to the locking member **43** which engages now the notch **49** of the sector **52**. At the end of the total taking cycle the lug **86** contacts the sector **52** at a distance of two line spaces from the slope **89**.

Supposing that after a printing cycle the paper is cut by the tearing ruler **19** (FIG. 2). Now no paper is sensed by the lug **95** (FIG. 3), whereby the spring **94** causes the lever **93** to lock with the lug **92** the ratchet wheel **91**. Consequently, the retracting stroke of the paper **10** is prevented, thus avoiding the typewheels **13** to print a new amount near to the paper edge and causing the locking member **42** (FIG. 1) to trip five line spaces on the teeth of the wheel **46**. During the returning stroke of the locking members **42** and **43**, the paper tape is advanced five line spaces and engages again the lug **95** (FIG. 3), whereby the lever **93** is rocked counterclockwise and disengages the lug **92** from the wheel **91**.

In all the hereinabove described cases the wheel **91**, through the two projections **104** and the notches **103** rocks the ring **102**, which through the notches **106** and the projections **107** rocks the pinion **101**. The pinion **99** is thus rotated together with the shaft **97**, and the paper feed rollers **98**, synchronously with the platen **11**, whereby the paper **10** is moved through the retracting and advancing stroke both by the platen **11** and the feed rollers **98**.

When the paper is to be introduced between the paper-guide-frame **96** and the platen **11** (FIG. 5), the frame **21** is manually displaced forwards bodily with the tearing ruler **19** by sliding with a pair of slots **125** on the universal bar **17**. The portion edge **119** of the frame **21** causes the arm **117** to rock against the urge of the spring **122**, whereby the paper-guide frame **96** is removed from the platen **11** bodily with the arm **117** and the rollers **98**.

During the introduction of the paper the frame **21** is held in the forwards displaced position by the arm **117** which engages the horizontal edge **120** of the frame **21**. After the introduction of the paper a printing cycle may be started without returning the frame **21** rearwards. In fact, immediately before the printing of the typewheels **13**, the universal bar is moved rearwards and automatically restores the frame rearwards.

When the frame **96** is removed from the platen **11** the shaft **97**, through the pinion **99** and the hole **112** displaces the arm **108** (FIG. 6) downwards, whereby the pinion **101** is also displaced downwards through the projection **109**. Therefore the pinion **101** continues to engage the ring **102** and the two pinions **101** and **99** remain mutally engaged even if the mutual position of the two shafts **12** and **97**, i.e. of the platen **11** and the feed roller **98**, is changed according to the paper thickness.

It is intended that modifications, improvements and additions of parts may be made to the described paper feed mechanism without departing from the scope of the invention as defined by the appended claims.

What we claim is:

1. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated before the printing in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, a ratchet wheel bodily rotatable with said platen, and a spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) cyclically operating means for moving said locking member through a predetermined forward stroke before the printing,

(b) means for causing said locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, said locking member being adapted to complete its said forward stroke independently from said ratchet wheel,

(d) and restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space.

2. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated before the printing in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, a ratchet wheel bodily rotatable with said platen, and a first spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) a cyclically operating means for moving said first locking member through a predetermined forward stroke before the printing,

(b) means for causing said first locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, said first locking member being adapted to complete said forward stroke independently from said ratchet wheel,

(d) restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space,

(e) a cam for controlling said intercepting member,

(f) a second spring urged locking member normally locking said cam and bodily reciprocable with said first locking member, said second locking member being adapted to yieldably operate said cam in both said directions,

(g) and settable means for setting said second locking member in a variable relationship with said cam.

3. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated before the printing in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, a ratchet wheel bodily rotatable with said platen, and a first spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) cyclically operating means for moving said locking member through a predetermined forward stroke before the printing,

(b) means for causing said first locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member being provided for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction,

said first locking member being adapted to complete said forward stroke independently from said ratchet wheel,

(d) restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space,

(e) a cam for controlling said intercepting member,

(f) a second spring urged locking member normally locking said cam and bodily reciprocated with said first locking member,

(g) said second locking member being adapted to yieldably rotate said cam in both said directions,

(h) and settable means selectively operated simultaneously with said cyclically operating means for setting said cam in a predetermined relationship with respect to said second locking member, whereby said intercepting member in the next following cycle will arrest said ratchet wheel according to said predetermined relationship.

4. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated before the printing in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, a ratchet wheel bodily rotatable with said platen, and by a first spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) a cyclically operating means for moving said first locking member through a predetermined forward stroke before the printing,

(b) means causing said first locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, said first locking member being adapted to complete said forward stroke independently from said ratchet wheel,

(d) restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space,

(e) a cam for controlling said intercepting member,

(f) a second spring urged locking member normally locking said cam and bodily reciprocable with said first locking member, said second locking member being adapted to yieldably operate said cam in both said directions,

(g) a pair of diametrically opposite elements secured to said cam,

(h) and a pair of cyclically operated pawls adapted to engage selectively said elements for setting said second locking member in said variable relationship with said cam.

5. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, a ratchet wheel bodily rotatable with said

platen, and a spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) a cyclically operating means for moving said locking member through a predetermined forward stroke before the printing,

(b) means for causing said locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, said locking member being adapted to complete said forward stroke independently from said ratchet wheel,

(d) restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space.

(e) a sensing member for sensing the paper substantially in correspondence with the last printed line,

(f) and an intercepting element connected to said sensed member for arresting said ratchet wheel at the beginning of the rotation in said predetermined direction in the case no paper is sensed by said sensing member.

6. In a paper feed mechanism for a printing calculating or like machine, having a platen adapted to be rotated in a predetermined direction a plurality of line spaces for retracting said paper and to be rotated after the printing in an opposite direction for advancing said paper at least one line space farther than said plurality of line spaces, paper feed rollers yieldably contacting said platen, a ratchet wheel bodily rotatable with said platen, and a spring urged locking member normally locking said ratchet wheel, the combination comprising:

(a) cyclically operating means for moving said locking member through a predetermined forward stroke before the printing,

(b) means for causing said locking member to yieldably rotate said ratchet wheel in said predetermined direction,

(c) an intercepting member for arresting said ratchet wheel after being rotated said plurality of line spaces in said predetermined direction, said locking member being adapted to complete said forward stroke independently from said ratchet wheel,

(d) restoring means effective after the printing for returning said locking member through a rearward stroke equal to said forward stroke to rotate said ratchet wheel in said opposite direction said farther line space,

(e) rotation transmitting means for causing said platen to synchronously rotate said rollers in opposite directions, whereby said paper is always moved by the combined action of said platen and said rollers,

(f) and connecting means for enabling said transmitting means to be effective independently from the mutual distance between said platen and said rollers.

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