Aug. 17, 1965 E. A. TOMLIN 3,201,040

COUNTING MECHANISMS

Filed Dec. 12, 1963 4 Sheets-Sheet 1

Fig. 1.

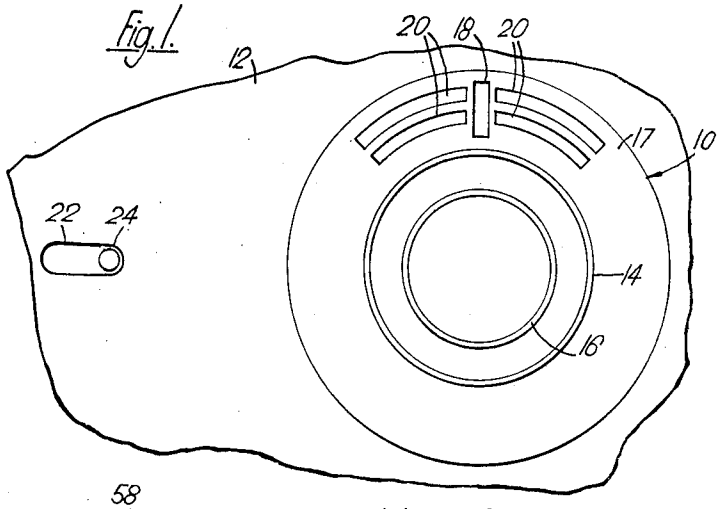


Fig. 2.

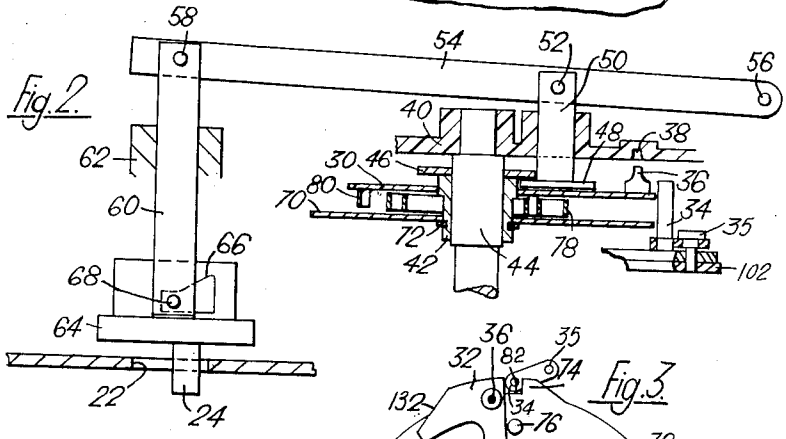
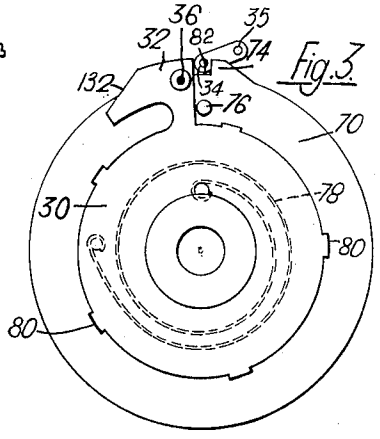


Fig. 3.



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COUNTING MECHANISMS

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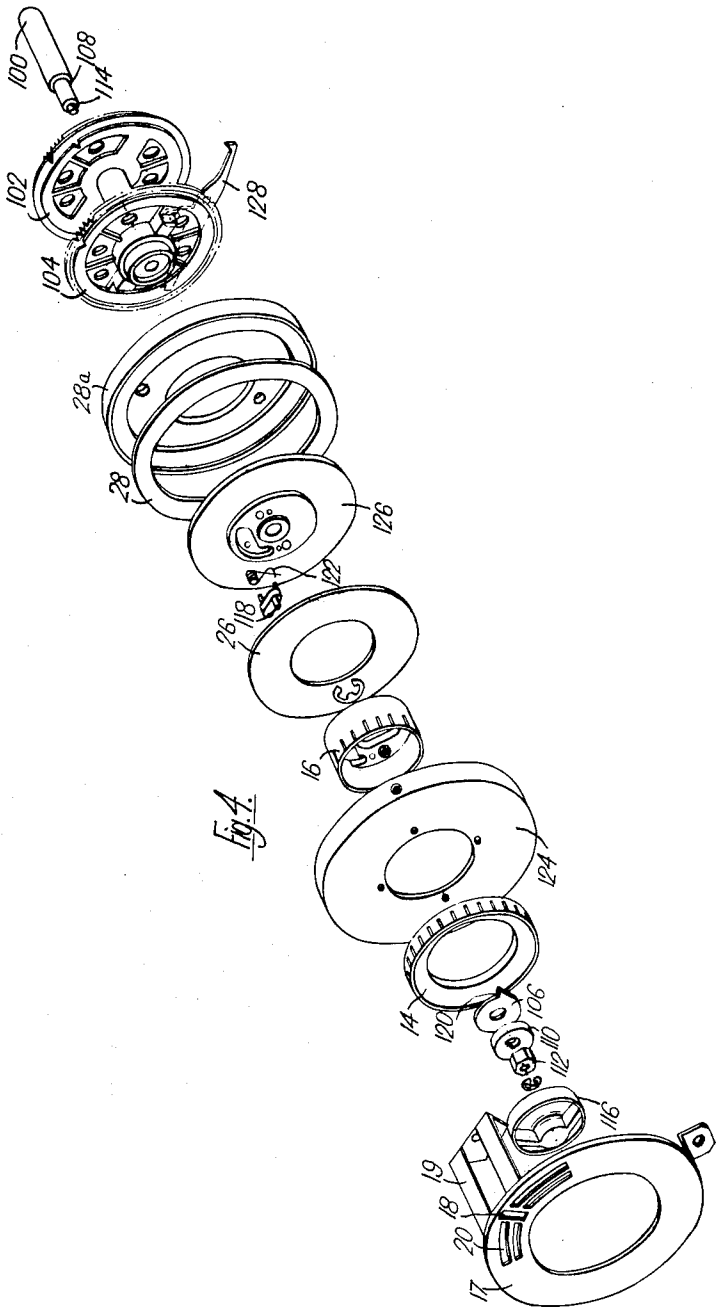

Fig. 4.

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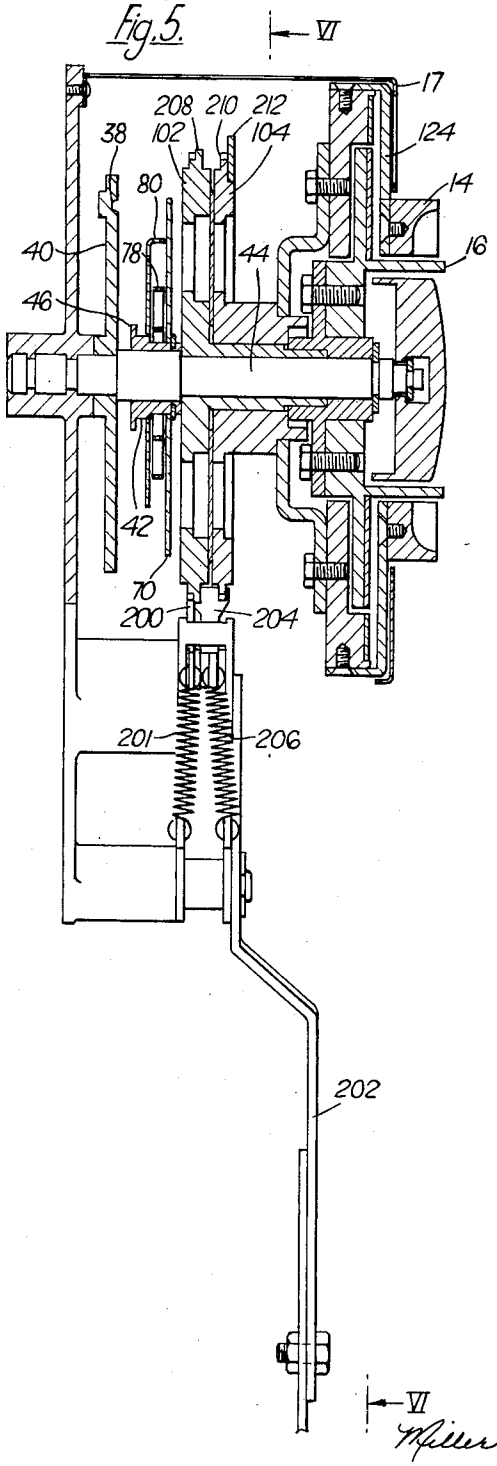
Fig. 5.



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COUNTING MECHANISMS

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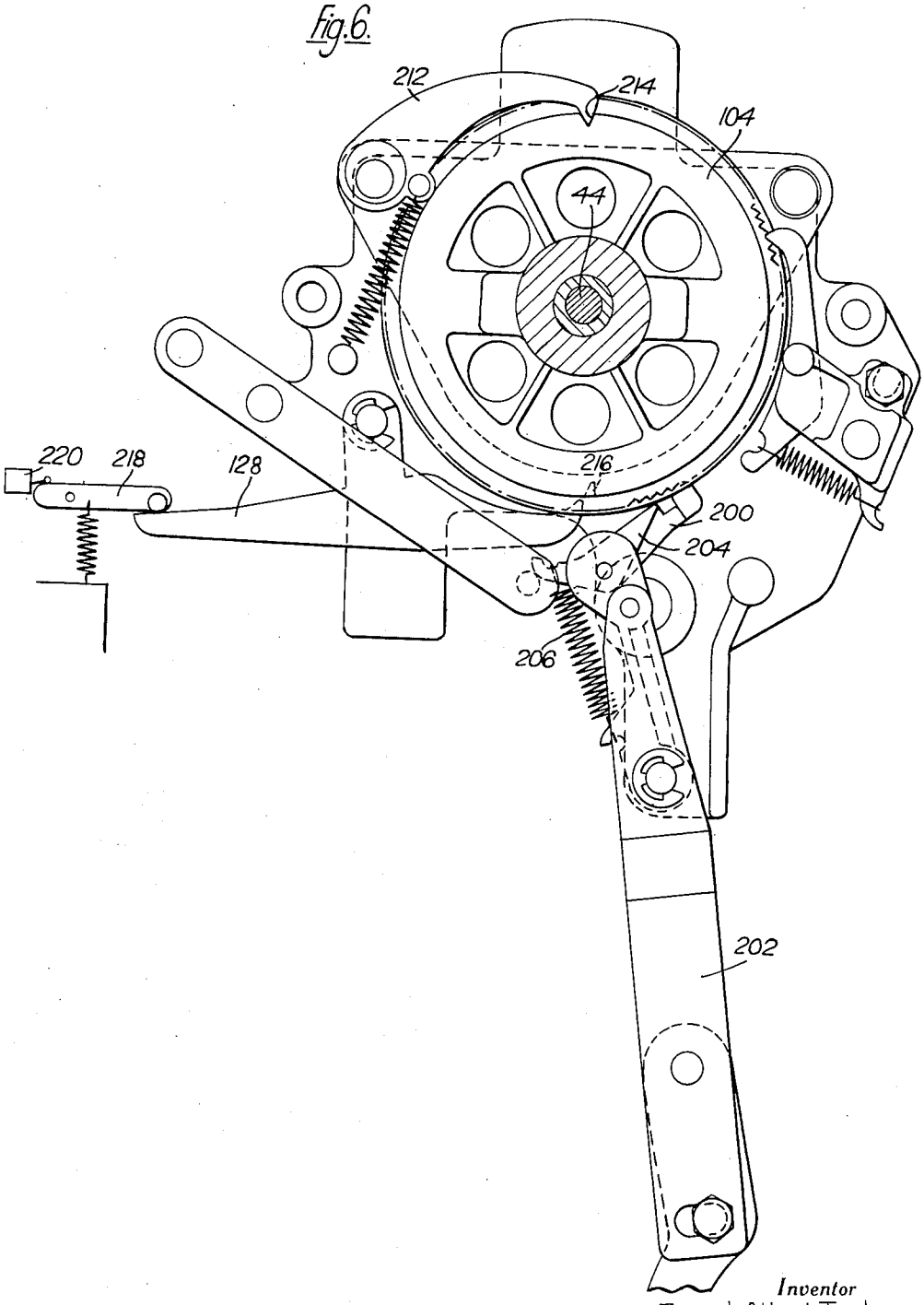
Fig. 6.



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3,201,040

COUNTING MECHANISMS

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Claims priority, application Great Britain, Dec. 21, 1962, 48,469/62
16 Claims. (Cl. 235—132)

This invention relates to counting mechanisms and is particularly concerned with improved counting mechanisms for duplicating or like machines.

Duplicating machines generally comprise a counting mechanism which can be preset so that the operation of the machine is stopped after a predetermined number of operating cycles. This enables an operator to print or duplicate a selected number of sheets without the necessity of counting or estimating the number of sheets printed by the machine. An object of the present invention is to provide such a counting mechanism with improved means for presetting the number of operating cycles to be carried out by the machine.

According to the invention there is provided a counting mechanism for a duplicating or like machine comprising a ratchet wheel adapted to be advanced tooth by tooth upon the completion of each operating cycle of the machine, means controlled by the ratchet wheel for stopping the machine when the ratchet wheel reaches a predetermined zero position, means for setting the ratchet wheel to a selectable initial position, and a releasable adjustable abutment lockable in a preset rotational position, a pawl rotatable with the ratchet wheel being engageable with the abutment for preventing movement of the ratchet wheel past an initial adjusted position of the abutment. Preferably, the means for setting the ratchet wheel comprises a movable reference member rotatable with the ratchet wheel relative to a fixed reference member. Desirably the fixed reference member may comprise a mask having a window displaying reference indicia on a dial comprising the movable reference member although the fixed reference member may comprise a dial bearing reference indicia, the movable reference member, which may be in the form of a knob, having an indicator comparable with the dial for showing the number of operating cycles to be completed by the machine.

In a preferred embodiment of our invention the abutment comprises an annular member rotatable about the axis of the ratchet wheel, a shoulder on the annular member being engageable by the pawl, means being provided for releasably locking the member in a preset rotational position. Preferably the annular member carries a projection selectively engageable with recesses provided in a non-rotatable coacting member, an individual recess being provided for each lockable position of the annular member. Conveniently the recesses may comprise holes in a plate-like coacting member, the projection comprising a pin selectively engageable in the holes by relative axial movement of the annular member and the coacting member. Desirably spring-biased means are provided for returning the ratchet wheel to a preselected position wherein the pawl engages the shoulder; such spring-biased means may conveniently comprise a plate parallel with the annular member and rotatable about the axis thereof, a spring rotatably biasing the plate to a rest position defined by stop means coacting between the annular member and the plate. It is preferred that the plate comprises a shoulder engageable by the pawl, a cam surface being provided for disengaging the pawl from the plate and thus permitting the plate to return to its rest position. This cam surface also acts so that the pawl is only engageable with the abutment provided by the annular

member when the pawl is rotated in one direction about the ratchet wheel axis but not when the pawl is rotated in the opposite direction. The abutment may comprise an annular washer rotatably mounted on a fixed spindle coaxial with the ratchet wheel, a shoulder being provided on the periphery of the washer. This washer is clampable in a fixed position by a lock nut threaded onto the spindle. In order to prevent interference of the abutment with the normal operation of the counting mechanism during use of the machine the washer preferably has a stepped periphery with a cam surface leading to the high side of the step comprising the shoulder whereby the abutment is effective to act as a stop when the pawl is rotated in one direction about the ratchet wheel axis but not when the pawl is rotated in the opposite direction, the pawl being spring-biased into engagement with the periphery of the washer.

In a particular constructional form of the invention the counting mechanism comprises two ratchet wheels and associated dials, the first wheel being adapted to count each individual operational cycle of the machine and the second wheel being adapted to count every revolution of the first wheel, the releasable stop being cooperable only with the first wheel.

The invention will now be described in greater detail, merely by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a fragmentary side elevational view showing the counting mechanism mounted on the side wall of a duplicator;

FIGURE 2 is a diagrammatic view partly in cross-section illustrating means for locking an abutment in any one of a plurality of selectable positions;

FIGURE 3 is a front elevational view of part of the locking means illustrated in FIGURE 2;

FIGURE 4 is an exploded perspective view of part of the counting mechanism embodying the present invention but with a modified adjustable stop as compared with the embodiments illustrated in FIGURES 1–3;

FIGURE 5 is a longitudinal sectional view of the counting mechanism of FIGURE 2; and

FIGURE 6 is a sectional view taken along the line VI—VI of FIGURE 5.

Referring to the drawings, there is shown in FIGURE 1 a counting mechanism generally indicated at **10** mounted on the fragmentarily illustrated side wall **12** of a duplicator. The counting mechanism comprises a mask **17** adapted to be fixed in position by a bracket **19** as illustrated in FIGURE 4. Projecting through the centre of the mask are coaxially arranged setting knobs **14** and **16**, the setting knob **16** being arranged for presetting a first ratchet wheel and the setting knob **14** being arranged to rotate a second ratchet wheel, comprising the counting mechanism. The second ratchet wheel is so arranged as to have only a slight rotation for every complete revolution of the first ratchet wheel. Also rotatable with the knobs **14**, **16** are second and first dials **28** and **26** respectively. The dials **26** and **28** are provided with indicia which show, through a window **18** provided in the mask **17**, the number of operations to be carried out by the counting mechanism. Windows **20** are also provided in the mask **17** for facilitating setting of the counting mechanism by an operator.

The counting mechanism of the present invention is provided with an adjustable abutment lockable in a preset rotational position. In the embodiment of FIGURES 1 and 2 the means for locking this adjustable abutment comprises a pin **24** projecting through a slot **22** in the duplicator wall **12**. FIGURE 2 shows this locking device in its unlocked condition. Referring to FIGURES 2 and 3, the presetting device comprises an annular member **30** provided with an abutment shoulder **32** engage-

able by a spring-loaded pawl 34 pivotally mounted by a pin 35 for rotation with the first ratchet wheel 102. The annular member 30 is further provided with a projection 36 in the form of a pin engageable in any one of a plurality of recesses or holes 38 provided in a fixed co-acting plate-like member 40. Conveniently the member 40 may be moulded from nylon or some similar hard wearing synthetic plastics material with the recesses 38 being arranged in an annular series, there being the same number of individual recesses 38 as there are teeth on the units ratchet wheel. The annular member 30 is mounted upon a hub 42 which is slidable upon a fixed spindle 44. By this means axial movement of the hub 42 on the spindle 44 can cause the projection 36 to engage or disengage a recess 38 in the coacting member 40.

The axial position of the hub 42 on the spindle 44 is controlled via a linkage by means of the pin 20, 24. This linkage comprises an annular disc 46 secured to the hub 42 and overlapping the head 48 of a rod 50 slidably carried in a bore extending through the coacting member 40. The end of the rod 50 remote from its head 48 is pivoted at 52 to a lever 54 which is carried at one end by a fixed pivot 56. The other end of the lever 54 is pivoted at 58 to a rod 60 mounted for sliding movement in a fixed bearing 62. The pin 24 is mounted on a slide 64 which carries a cam surface 66 engageable with a follower pin 68 mounted on the shaft 60. The arrangement is such that movement of the slide 64 by means of the pin 24 causes the cam surface 66 to control the position of the follower 68 and thus the axial position of the shaft 60. It will be clear that movement of the pin 24 from the position shown in FIGURE 2 towards the left will allow the shaft 60 to move in a direction to rotate the lever 54 clockwise about the pivot 56 under the influence of a spring bias not shown. This clockwise movement of the lever 54 will cause the head 48 of the rod 50 to engage the disc 46 and pull the hub 42, and thus the annular member 30, to a position such that the pin 36 engages in a recess 38.

A plate 70 is rotatably mounted on the hub 42 and is retained thereon by a circlip 72. The plate 70 is provided with a projecting shoulder portion 74 which is engageable by the pawl 34. A pin 76 is mounted on the plate 70 to act as a stop engageable with the shoulder 32 to limit rotational movement of the plate 70 relative to the annular member 30.

A spiral spring 78 is secured between the annular member 30 and the plate 70 parallel therewith. This spring is arranged to bias the stop 76 against the abutment shoulder 32 of the annular member in the position as shown in FIGURE 3. Tabs 80 are bent towards the plate 70 from the periphery of the annular member 30 in order to retain the spiral spring within the circumference of the annular member 30. When the plate 70 is in its rest position relative to the annular member 30, as shown in FIGURE 3, the space 82 between the adjacent shoulders 32 and 74 is sufficient to receive the spring-loaded pawl 34.

Referring to FIGURE 4, there is shown a counting mechanism which comprises a fixed spindle 100, corresponding with the fixed spindle 44 of the embodiment of FIGURE 2, upon which are rotatably mounted a first ratchet wheel 102 having a hundred teeth, a second ratchet wheel 104 also having a hundred teeth, a hundreds dial 28 rotatable with the second ratchet wheel, a units dial 26 rotatable with the first ratchet wheel, a first setting knob 16 rotatable with the first ratchet wheel and a second setting knob 14 rotatable with the second ratchet wheel. A presetting pawl washer 106 is rotatably mounted near one end of the spindle 100 between a shoulder 108 on the spindle and a clamp washer 110 non-rotatably but slidably mounted on the spindle. A lock nut 112 is mounted on the threaded end portion 114 of the spindle so as to be engageable with the axially movable clamp washer 110, whereby upon tightening of the lock nut 112 the pawl washer 106 may be clamped between the clamp washer 110 and the shoulder 108 on the spindle. A knob 116 may be mounted on the lock nut 112 to facilitate rotation and tightening of the same.

In general it will be appreciated from FIGURE 4 that the second ratchet wheel 104 is secured to a hundreds dial disc 28*a* which in turn is secured to the hundreds dial 28, a counter window member 124 and the second setting knob 14, all these integers being mounted for rotation about the axis of the spindle 100. Similarly, the first ratchet wheel 102 is mounted upon a units mounting hub 126 to which are secured the first dial 26 and the units setting knob 16. A pawl 118 is mounted upon the hub 126 and is biased by a spring 122 against the periphery of the pawl washer 106. With this arrangement the units dial 26 thus comprises a movable reference member which cooperates with a fixed reference member, mask 17, to indicate the position of the first ratchet wheel 102.

In both embodiments the mechanism is mounted in a duplicating machine with a pawl 200 operable by the duplicating machine drive for advancing the first ratchet wheel 102 by one tooth once during each operating cycle of the duplicating machine. FIGURES 5 and 6 show the pawl 200 to be movable in response to reciprocation of a reciprocable link 202. The pawl 200 is held in engagement with the first ratchet wheel by a pawl spring 201. There is a drive from the first ratchet wheel 102 to the second ratchet wheel 104 whereby the second ratchet wheel is advanced by one tooth upon every revolution of the first ratchet wheel. This drive, which is conventional in counting mechanism and which forms no part of the present invention, comprises a second pawl 204 mounted with the pawl 202 for movement in response to reciprocation of the link 202. The second pawl is urged towards both ratchet wheels 102 and 104 by a pawl spring 206 but normally engages a surface 208 extending peripherally of the first ratchet wheel 102 and serving to hold the second pawl 204 out of engagement with ratchet teeth 210 on the second ratchet wheel. A single notch is provided in the surface 208 which, when engaged by the pawl 204, allows the pawl to engage one of the teeth 210 of the second ratchet wheel 104.

A releasable zero pawl 212 may be provided for facilitating adjustment of the second ratchet wheel to its zero position, the zero pawl 212 being engageable in a locating recess 214 in the second ratchet wheel when the ratchet wheel is in its zero position. A further, shutoff pawl 128, engageable with both ratchet wheels is provided for switching off the duplicating machine drive and stopping the duplicating machine when both ratchet wheels are at the zero position. The shutoff pawl 128 is simultaneously engageable with deep notches 216 in both ratchet wheels, these notches corresponding with the zero position of the respective ratchet, wheels, only when both ratchet wheels are in their zero positions. When one wheel only is in its zero position the other ratchet wheel holds the shutoff pawl 128 in a position disengaged from the notch in the one ratchet wheel. The shutoff pawl 128 is connected to the duplicating machine drive so as to constitute means for shutting off and stopping the machine upon movement into the deep notches 216 when the ratchet wheels are both in their zero position. As illustrated in FIGURE 6 a lever 218 is spring biased to urge the shutoff pawl into engagement with the ratchet wheels and constitutes the connection to the duplicating machine drive by actuating a switch 220 to switch off the duplicator drive in response to engagement of the shutoff pawl 128 in the notches 216.

As shown in FIGURE 6, the various pawls engageable with the ratchet wheels are spring urged against the ratchet wheels and the notches or teeth of the ratchet wheels have sloping sides so that the pawls are cammed out of restraining engagement with the ratchet wheels

whenever the ratchet wheels are rotated by means of the first setting knob **16** or the second setting knob **14**.

During operation of the counting mechanism without use of the presetting device, i.e. when with the embodiment of FIGURE 4 the pawl washer **106** is not clamped between the non-rotatable clamp washer **110** and the spindle shoulder **108**, or in the embodiment of FIGURES 1, 2, 3, 5 and 6 the projecting pin **36** is not engaged with a recess **38**, the first and second setting knobs are set to the number of copies required from the duplicating machine and the machine is then started. When the required number of operating cycles has taken place the ratchet wheels both reach their zero position and the shut-off pawl **128** engages both deep notches **216** and operates to actuate switch **220** and to stop the machine drive. When it is desired repeatedly to run off the same predetermined number of copies from a succession of master sheets or stencils the adjustable stop provided by the presettable pawl washer or by the stop provided by the presettable pawl washer or by the annular member **30**, as the case may be, may be brought into use to facilitate resetting of the counting mechanism after the running off of the required number of copies of each page.

Referring first to the operation of the embodiment of FIGURE 4, the hundreds dial (**28**) is set to zero and the preset lock is rotated to unclamp the pawl washer **106**. The first setting knob **16** is then rotated in the direction opposite to the normal direction of rotation of the ratchet wheel **102** so that the presetting pawl **118** mounted for rotation with the first setting knob **16** rotates into engagement with a stepped shoulder **120** on the pawl washer and rotates the washer until the required number appears in the window **18**. The preset knob **116** is then rotated to tighten the lock nut **112** and clamp the pawl washer **106** to the fixed spindle **100**. Then, after that predetermined number of operating cycles has been carried out, in order to reset the counting mechanism, the first setting knob **16** is merely turned back until the reseting pawl **118** re-engages the stepped shoulder **120** of the pawl washer **106**.

In order to prevent interference with the normal operation of the counting mechanism by the presettable pawl washer **106** and the preseting pawl **118** should the operator fail to unclamp the pawl washer, the outer periphery of the pawl washer is formed as a cam surface so that it only engages and retains the presetting pawl when the presetting pawl is moved in one direction against the stepped shoulder. Thus, during normal operation of a counting mechanism the presetting pawl would merely jump down the stepped shoulder under the action of a spring **122** biasing it against the periphery of the pawl washer.

The action of the presetting device of FIGURES 1, 2, 3, 5 and 6 is basically similar to that of the embodiment of FIGURE 4 except that a spring means is provided for automatically returning the counting mechanism to its preset position. Thus as compared with the structure shown in FIGURE 4, the pawl **118** is replaced by the equivalent pawl **34** and the washer **106** by the annular member **30** which is lockable in position by the action of the pin **24** instead of by the lock nut **116**. In order to set the presetting device the operator first moves the pin **24** to the position shown in FIGURE 2. The operator then rotates the first knob until the units dial **26** indicates the required number of copies in the window **18**. The operator then moves the pin **24** to the left (with reference to FIGURE 2) so that the annular member **30** becomes locked in position by engagement of pin **36** in the appropriate recess **38**. Upon starting operation of the duplicating machine the movement of the first ratchet wheel **102** step by step by the duplicating machine causes the pawl **34** to rotate in a clockwise direction, referring to FIGURE 3, while at the same time the plate **70** rotates with it due to engagement of the pawl with the shoulder **74**. When the first ratchet wheel reaches its zero position the counting mechanism operates in the usual manner by means of the shut-off pawl **128** to shut-off the duplicating machine, the ratchet wheel is released, and the spring **78**, which has been tensioned by the rotation of the plate **70**, urges the plate **70** back in a counterclockwise direction until further movement is prevented by engagement of the pin **76** with the shoulder **32** of the locked annular member **30**. This back rotation of the pawl **34** automatically resets the first ratchet wheel due to the connection between the pawl and the ratchet wheel.

The abutment shoulder **32** is provided with a cam surface **132** whereby when more than a hundred copies are to be run off by the duplicating machine the pawl **34** is automatically released from the shoulder **74** as it rides up the surface **132** so that the spring **78** can return the plate **70** to its starting position. The plate **70** flies back to its starting position as the pawl moves along the outer peripheral surface of the shoulder **32**, the starting position being determined by the pin **76** engaging a radial edge of the shoulder **32** as shown in FIGURE 3. The pawl can then drop into the space **82** is it leaves the shoulder **32** and recommence movement of the stop-plate **70**. The action of the cam surface **132** on the abutment **32** generally corresponds with the action of the came surface of the outer periphery of the pawl washer **106** shown in FIGURE 4 and ensures that the shoulder **32** only has a one way action to prevent reverse rotation of the pawl **34** and first ratchet wheel **102** past a preset position determined by the particular hole **38** engaged by pin **36**, and does not interfere with the forward rotation of the first ratchet wheel.

It will be appreciated that no adjustable stop for facilitating presetting of the second ratchet wheel need be provided, as any time-saving would be negligible when compared with the time taken to run off the larger number of copies of any one master sheet or stencil.

I claim:

1. A counting mechanism for a duplicating machine, such mechanism comprising a ratchet wheel having an axis about which it is rotatable and having teeth about its periphery adapted to be advanced upon the completion of each operating cycle of the machine forwardly to rotate the ratchet wheel; means controlled by said ratchet wheel for stopping the machine when the ratchet wheel reaches a predetermined zero position; means for setting the ratchet wheel to a selectable initial position, such means for setting the ratchet wheel comprising a fixed reference member and a movable reference member rotatable with said ratchet wheel relative to said fixed reference member; an abutment comprising an annular rotatable about the axis of the ratchet wheel, means defining a shoulder on said annular member, and means for releasably locking said annular member in a preset rotational position corresponding with the initial position of the ratchet wheel, said last mentioned means comprising a projecting pin carried by said annular member; a plate-like coating member mounted for axial movement relative to said annular member, a plurality of holes being defined in said coacting member with an individual hole being provided for each operable position of said annular member; a plate parallel with said annular member and rotatable about the axis thereof; stop means coacting between said annular member and said plate to define a rest position of said plate relative to said annular member; a spring rotatably biasing said plate to said rest position, said plate comprising a shoulder; and a pawl rotatable with said ratchet wheel, said pawl being engageable with said annular member shoulder for preventing rearward movement of said ratchet wheel past initial adjusted position and with said plate shoulder, said annular member being provided with a cam surface adapted upon forward rotation of the ratchet wheel to engage said pawl to disengage said pawl from said

plate whereby said plate is permitted to return to its rest position.

2. A counting mechanism for a duplicating machine, comprising a ratchet wheel having an axis about which it is rotatable and having teeth about its periphery, the successive teeth being adapted to be advanced upon the completion of each operating cycle of the machine forwardly to rotate the ratchet wheel, means controlled by the ratchet wheel for stopping the machine when the ratchet wheel reaches a predetermined zero position, means for setting the ratchet wheel to a selectable initial position, an abutment mounted for rotational movement about the ratchet wheel axis; means for releasably locking the abutment in a present rotational position corresponding with the initial position of the ratchet wheel, and a pawl rotatable with the ratchet wheel, said pawl being engagable with the abutment for preventing movement of the ratchet wheel in one direction past an initial adjusted position, said abutment being provided with means for permitting the pawl to ride past the allow unobstructed forward movement of the ratchet wheel in the opposite direction.

3. A counting mechanism according to claim 2, wherein the means for setting the ratchet wheel comprises a fixed reference member and a movable reference member rotatable with the ratchet wheel relative to the fixed reference member.

4. A counting mechanism to claim 3, wherein the movable reference member comprises a dial having reference indicia thereon and the fixed reference member comprises a mask having a window displaying said reference indicia.

5. A counting mechanism according to claim 3, wherein the fixed reference member comprises a dial bearing refrence indicia, and the movable reference member comprises a knob having an indicator for showing in cooperation with the dial the number of operating cycles to be completed by the machine.

6. A counting mechanism for counting the operating cycles of a duplicating machine, comprising a ratchet wheel having an axis about which it is rotatable and having teeth about its periphery, the successive teeth being adapted to be advanced upon the completion of each operating cycle forwardly to rotate the ratchet wheel, means controlled by said ratchet wheel for stopping the machine when said ratchet wheel reaches a predetermined zero position, means for setting the ratchet wheel to a selectable initial position, an annular member rotatable about the axis of the ratchet wheel, means defining a shoulder on said annular member, means for releasably locking said annular member in a preset rotational position with the shoulder in a position corresponding with the initial position of the ratchet wheel, and a pawl rotatable with said ratchet wheel, said pawl being engageable with said shoulder for preventing reverse movement of the ratchet wheel past its initial adjusted position, and said annular member comprising a cam surface on one side of the shoulder for permitting the pawl to ride past the shoulder upon forward movement of the ratchet wheel.

7. A counting mechanism according to claim 6, wherein the means for locking the member in a present rotational position comprise a non-rotatable coacting member provided with a plurality of recesses, an individual recess being provided for each operable position of said annular member, and a projection provided on said annular member, said projection being selectively engageable with said recesses.

8. A counting mechanism according to claim 7, wherein the coacting member has a plate-like configuration, the recesses consisting of holes in said plate-like coacting member, said coacting member and said annular member being mounted for relative axial movement, and said projection comprises a pin mounted on said annular member and selectively engageable in said holes by relative axial movement of said annular member and said coacting member.

9. A counting mechanism according to claim 6, which comprises spring biased means for returning the ratchet wheel to a preselected position wherein said pawl engages said shoulder.

10. A counting mechanism for a duplicating machine, comprising a ratchet wheel having an axis about which it is rotatable and having teeth about its periphery, the successive teeth being adapted to be advanced upon the completion of each operating cycle of the machine forwardly to rotate the ratchet wheel, means controlled by said ratchet wheel for stopping the machine when said ratchet wheel reaches a predetermined zero position, means for setting the ratchet wheel in a selectable initial position, an abutment comprising an annular member mounted for rotation about the ratchet wheel axis and including means defining a peripheral shoulder, a plate-like coacting member mounted for axial movement relative to said annular member, stop means between said plate-like coacting member and said annular member engageable by relative axial movement of the annular member and the coacting member for locking the annular member in a preset rotational position corresponding with the initial position of the ratchet wheel, said stop means comprising a pin projecting from said annular member and means defining a plurality of holes in said plate-like coacting member, an individual hole being provided for each operable position of said annular member, said pin being selectively engageable in said holes by relative axial movement of said annular member and said coacting member, a pawl rotatable with the ratchet wheel, said pawl being engageable with said peripheral shoulder for preventing rearward rotational movement of said ratchet wheel past its initial adjusted position but permitting forward movement of the ratchet wheel past its initial adjusted position and spring biased means for returning said ratchet wheel to a preset position wherein said pawl engages said shoulder.

11. A counting mechanism according to claim 10, wherein said spring biased means comprises a plate parallel with said annular member and rotatable about the axis thereof, a spring rotatably biasing the plate to a rest position, and second stop means between said annular member and said plate cooperable to define said rest position.

12. A counting mechanism according to claim 11, wherein said plate comprises a shoulder engageable by said pawl.

13. A counting mechanism according to claim 12, wherein said annular member comprises a cam surface engageable with said pawl for disengaging said pawl from said plate whereby said plate is permitted to return to said rest position.

14. A counting mechanism for a duplicating machine, comprising a fixed spindle, a ratchet wheel mounted for rotation on said spindle, said ratchet wheel having teeth about its periphery, the successive teeth being adapted to be advanced upon the completion of each operating cycle of the machine forwardly to rotate the ratchet wheel, means controlled by said ratchet wheel for stopping the machine when said ratchet wheel reaches a predetermined zero position, means for setting said ratchet wheel to a selectable initial position, a washer rotatably mounted on said fixed spindle and having a radially projecting shoulder, means for releasably locking the washer in a preset rotational position corresponding with the initial position of the ratchet wheel, and a pawl rotatable with said ratchet wheel, said pawl being engageable with said shoulder for preventing rearward movement of said ratchet wheel past its initial adjusted position, said washer comprising a stepped periphery having a cam surface leading to the high side of the step comprising the shoulder, whereby the abutment is effective when the pawl is rotated in the reverse direction about said

spindle but not when the pawl is rotated in the forward direction, said pawl being spring biased into engagement with the periphery of the washer.

15. A counting mechanism according to claim **14**, which comprises a lock nut threaded on to said fixed spindle, said washer being clampable in a fixed position by said lock nut.

16. A counting mechanism for a duplicating machine adapted to complete a succession of operating cycles, such counting mechanism comprising a first ratchet wheel having teeth about its periphery, the successive teeth being adapted to be advanced upon the completion of each operating cycle of the machine forwardly to rotate said first ratchet wheel, a second ratchet wheel coaxial with said first ratchet wheel, said second ratchet wheel having teeth about its periphery, the successive teeth of the second ratchet wheel being adapted to be advanced upon the completion of each revolution of said first ratchet wheel forwardly to rotate said second ratchet wheel, means controlled by said ratchet wheels for stopping the machine when both said ratchet wheels reach a predetermined zero position, means for setting said ratchet wheels to a selectable initial position, an abutment mounted for rotational movement about the ratchet wheel axis, means

for releasably locking the abutment in a preset rotational position corresponding with the initial position of the first ratchet wheel, a pawl rotatable with said first ratchet wheel, said pawl being engageable with said abutment for preventing return movement of said first ratchet wheel past its initial adjusted position, and means for disengaging said pawl from said abutment at least once every advancing revolution of said first ratchet wheel.

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LEO SMILOW, *Primary Examiner.*