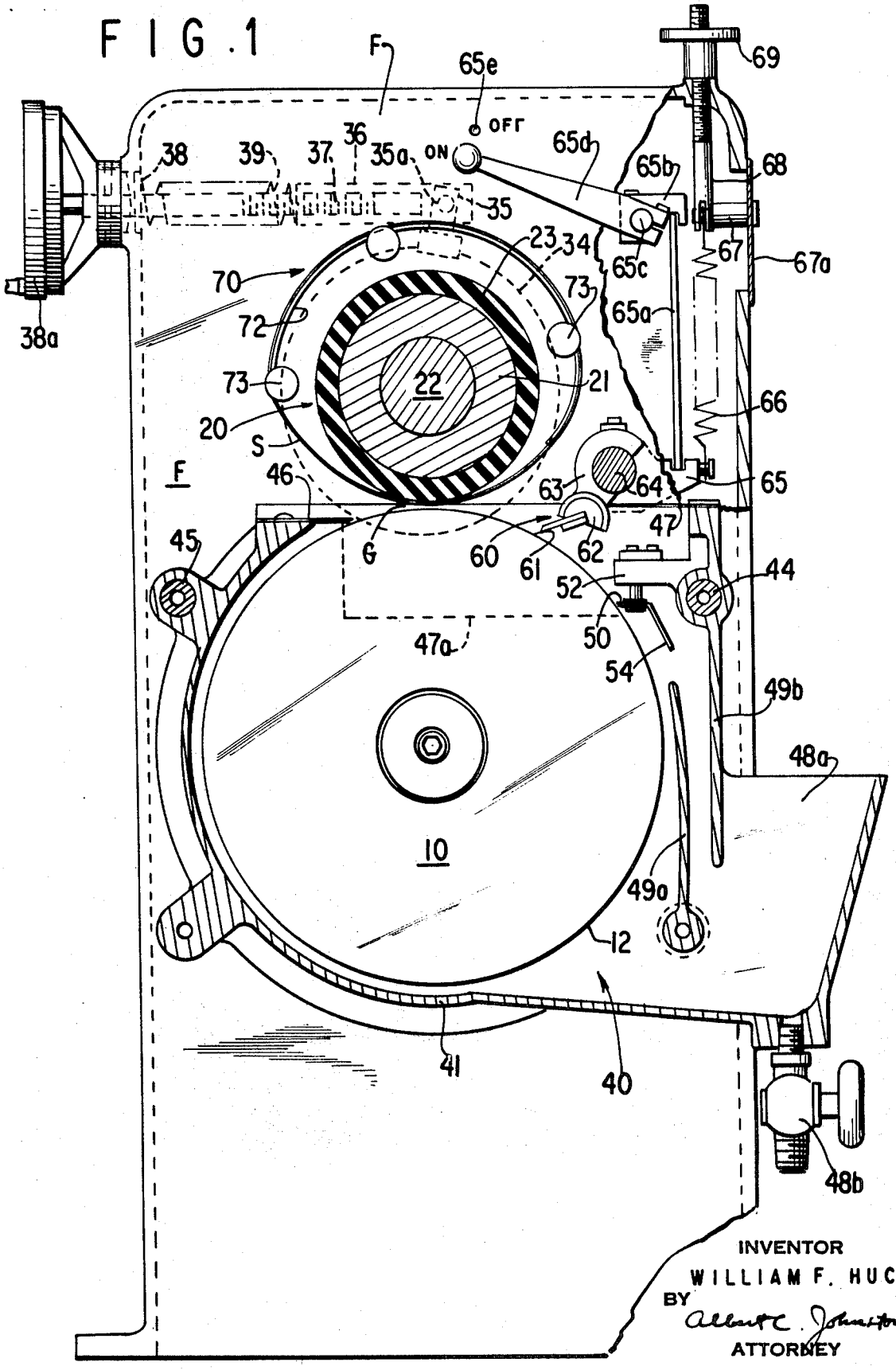
Sept. 20, 1971 W. F. HUCK 3,605,615

PRINTABILITY TESTER

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FIG. 1



INVENTOR
WILLIAM F. HUCK
BY
ATTORNEY

Sept. 20, 1971 W. F. HUCK 3,605,615

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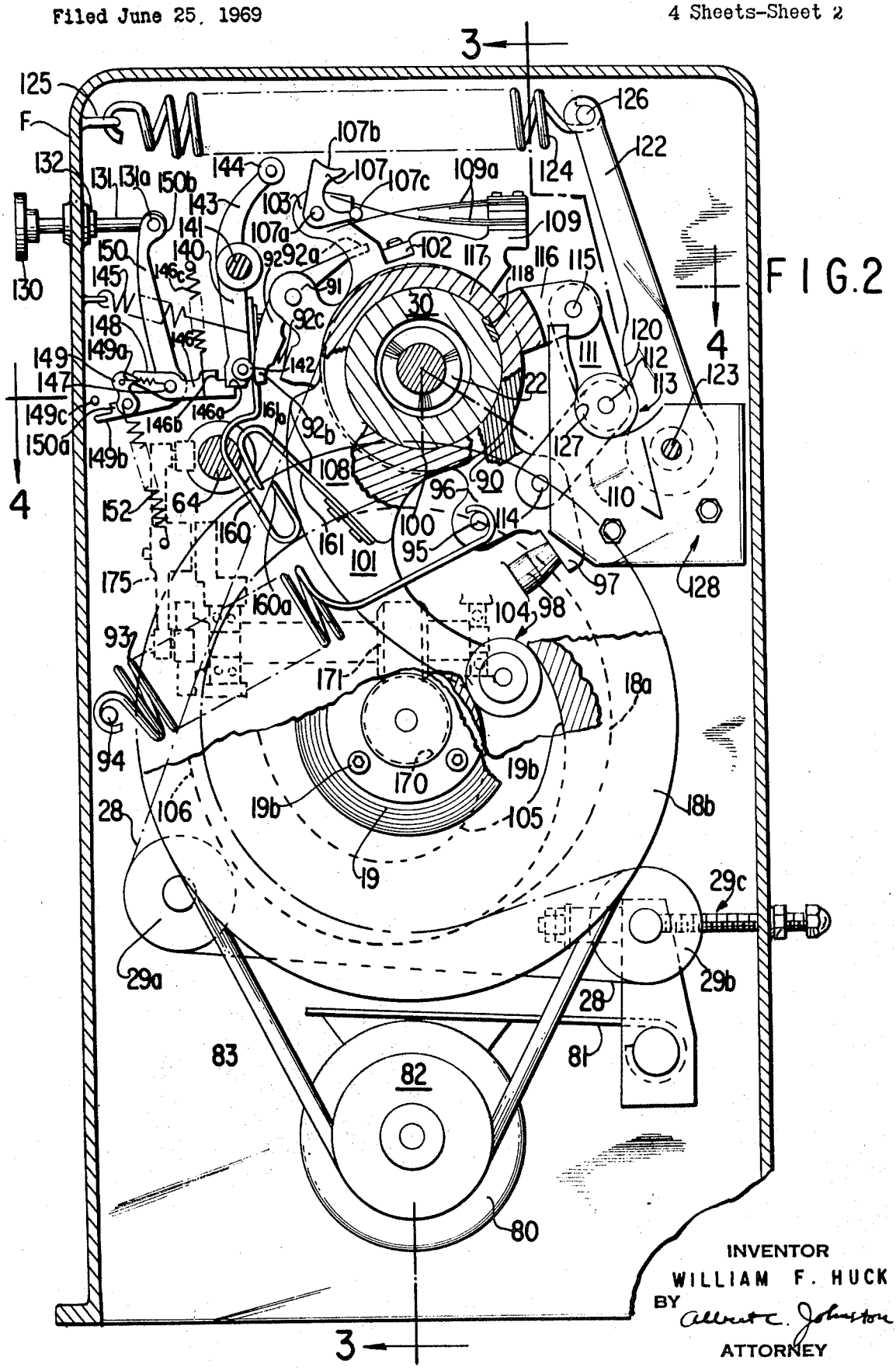


FIG. 2

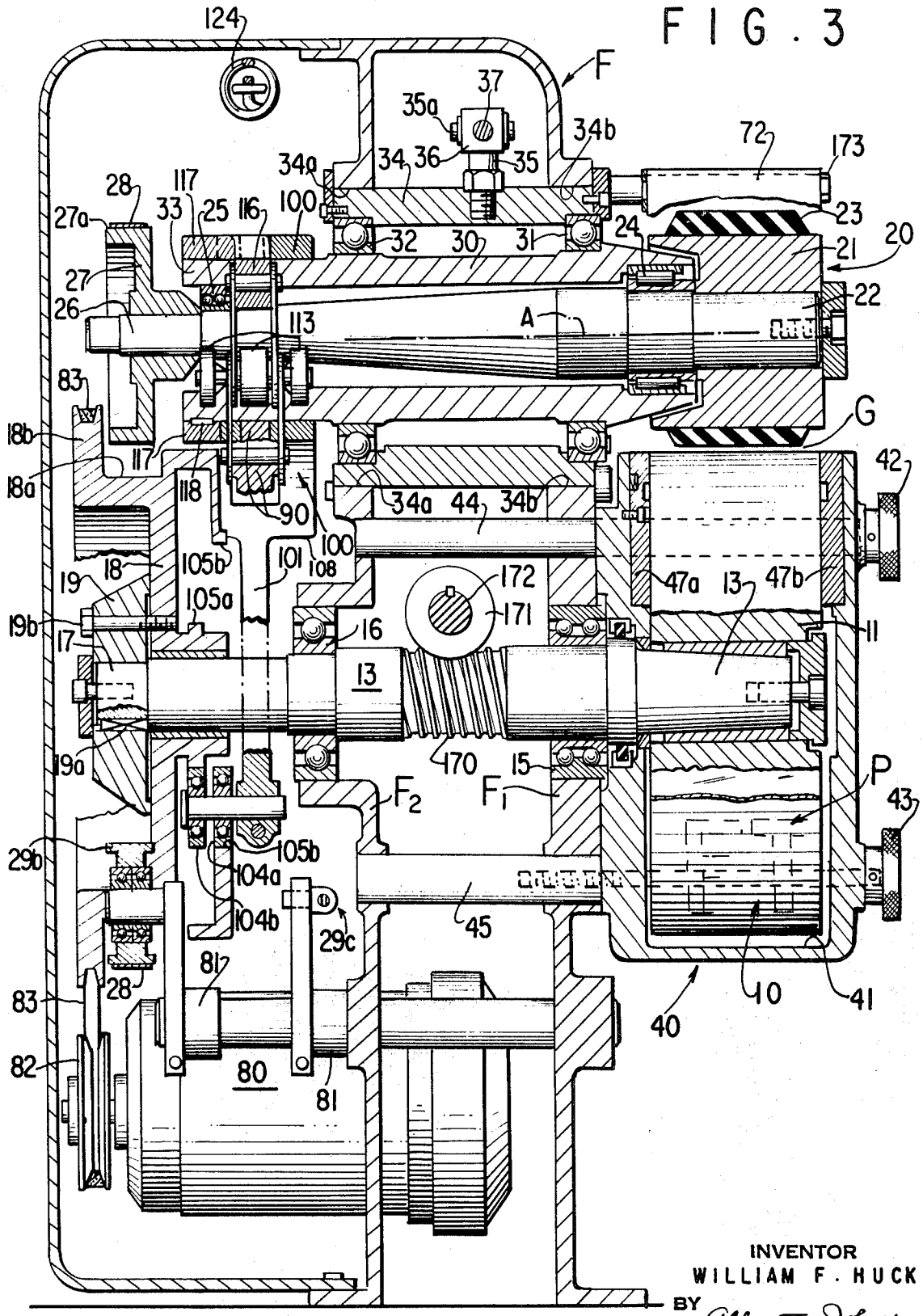
INVENTOR
WILLIAM F. HUCK
BY Albert C. Johnston
ATTORNEY

Sept. 20, 1971 W. F. HUCK 3,605,615

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FIG. 3



INVENTOR
WILLIAM F. HUCK
BY Albert C. Johnston
ATTORNEY

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FIG. 5

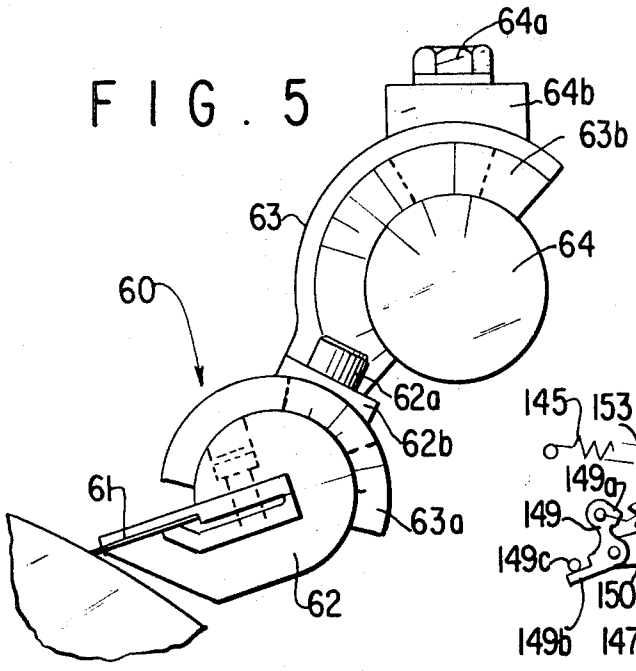


FIG. 6

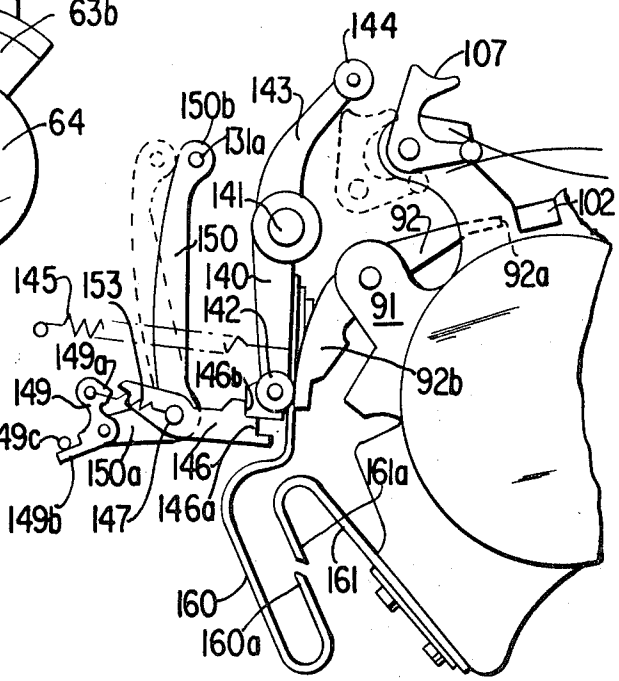


FIG. 7

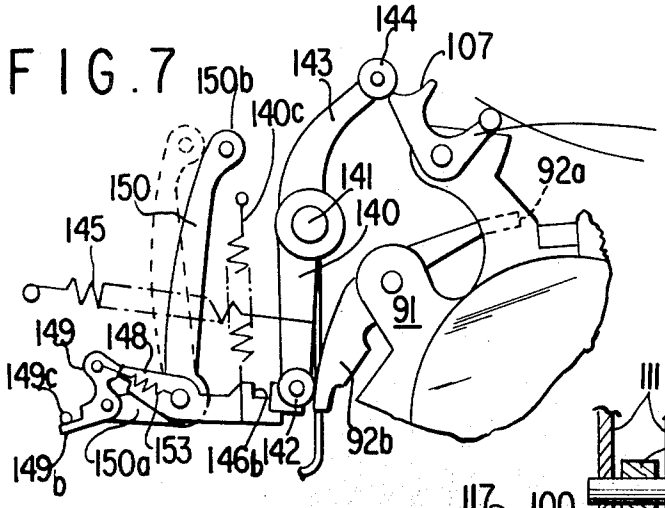
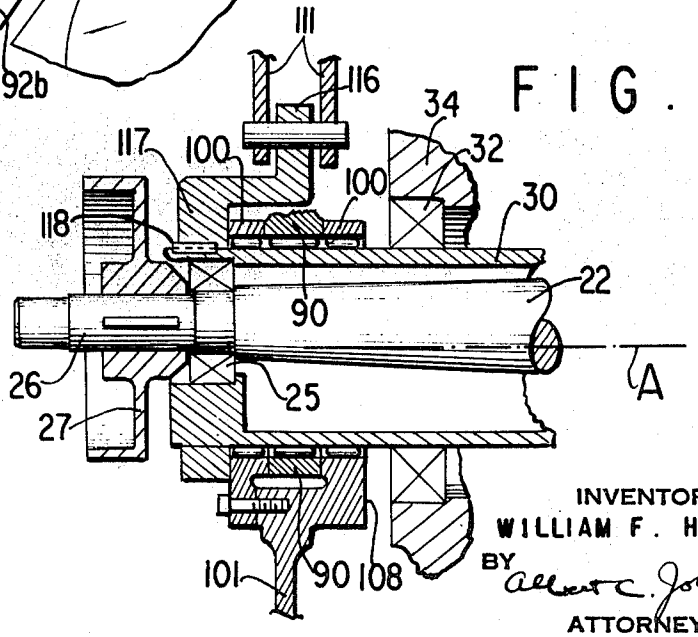


FIG. 4



INVENTOR
WILLIAM F. HUCK
BY Albert C. Johnston
ATTORNEY

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3,605,615

PRINTABILITY TESTER

William F. Huck, 285 Gregory Road, Franklin Lakes, N.J. 07417

Filed June 25, 1969, Ser. No. 836,292
Int. Cl. B41f 9/04
U.S. Cl. 101—153 11 Claims

ABSTRACT OF THE DISCLOSURE

A machine for testing the printability of papers, inks and printing patterns, especially in gravure printing, wherein a rotating impression roll is displaceable to press a looped paper sample briefly against a rotating printing cylinder so as to imprint a single pattern on the sample, is provided with an eccentric sleeve mounting for the impression roll shaft and with actuating and control mechanisms which act upon the sleeve to displace the roll in precise, speed-independent relationship to the rotational position of the pattern to be test printed. The sleeve mounting provides for precise adjustment of the impression roll pressure. A force-limiting coupling protects against pressure overloads. Controls assure a single imprint irrespective of the moment or the duration of manual initiation of a printing test.

This invention relates to improvements of a machine or instrument called a printability tester, the purpose of which is to enable reliable evaluations of the printing properties of inks, papers or other printing materials by tests of them which simulate commercial printing operations yet can be carried out efficiently on a laboratory scale. The invention is particularly beneficial for testing the stability of various materials for use in high speed rotogravure printing.

A mechanism to serve as such a printability tester, proposed heretofore, involves basically the provision of a rotary gravure cylinder and an impression roll, each on a rotary support protruding from the front of a box frame, with an ink fountain, a doctor blade and a predoctor coacting with the engraved surface of the cylinder and certain actuating, control and drive elements coacting with the rotary supports. The impression roll is normally to be out of engagement with the gravure cylinder, and a paper guide is arranged adjacent to the impression roll so that a paper sample in looped form placed about the guide will extend through a gap normally present between the impression roll and the cylinder. The cylinder and roll are to be kept in continuous rotation, with continuous inking and doctoring of the printing elements of several image areas, or printing patterns, engraved in circumferentially spaced portions of the surface of the cylinder. An imprint of a single selected pattern is to be made on the paper sample in a portion of a single revolution of the cylinder by displacement of the impression roll on an eccentric support into and from a printing position in which the roll will press the paper sample against the surface of the rotating gravure cylinder for a brief interval.

The proposed printability tester, although effectual as to certain basic relationships of its elements, has shown a variety of deficiencies which prevent it from fulfilling the purpose above stated.

Among these deficiencies are that the mechanism is susceptible to differences of action at different rotational speeds and is not sufficiently reliable for repeatedly printing the whole of a certain selected pattern on successive paper samples; it lacks adequate provision for regulation of the impression roll pressure to suit varied test conditions; and it can be overstressed by working with

a sample of relatively thick sheet material if the samples being test printed one after another differ very much in thickness or compressibility.

The principal object of the present invention is to provide an improved printability tester which will overcome such deficiencies and fulfill successfully the purpose above stated.

To this end, according to the invention, a rigid rotary shaft carrying the impression roll on its forward end is supported rotatably and eccentrically in a sleeve which in turn is held rotatably within a bearing ring mounted in the frame of the machine, a backward part of this shaft being provided with drive means for rotating it continuously in synchronism with a main shaft carrying the printing cylinder in juxtaposition to the impression roll, and elements for displacing the impression roll so as to cause a single imprinting of a selected pattern on each paper sample—including a driven member turnable with the sleeve, a drive member rocked about the axis of rotation of the sleeve in synchronism with the rotation of the printing cylinder, means for connecting those members together to turn the sleeve and means for activating and inactivating such connecting means—are arranged to operate in constant coordination with the rotational positions of the selected pattern on the surface of the printing cylinder.

Thus, the improved machine can operate reliably to give an imprint of the selected pattern on each paper sample, at any rotational speed that may be chosen for the printing.

According to another feature of the invention, the sleeve eccentrically supporting the shaft of the impression roll is itself supported eccentrically in a bearing ring which is turnable in the stationary frame, and means are provided for turning the bearing ring so as to alter the distance between the respective axes of the sleeve and the printing cylinder and thus secure precise adjustments of the pressure to be applied by the impression roll against the paper or other sheet material to be imprinted.

According to another feature of the invention, the above mentioned driven member turnable with the sleeve is connected with the sleeves through force-limiting means which prevent the torque transmitted by the said connecting means, and thus the pressure applied by the impression roll in printing position, from exceeding a predetermined value. By simply pre-selecting the magnitude of this maximum turning force, the pressure to be applied by the impression roll can be readily limited so as to protect the machine against being overloaded when a paper sample used in thicker or more rigid than that for which the impression roll is pre-set.

Still other important features of the invention reside in its provisions for ensuring that the printing of each paper sample will begin only in proper relation to the approach of a selected printing pattern to the impression roll and that the impression roll will be returned from printing position to normal idle position when that one pattern has moved beyond it, irrespective of the printing speed used and of the moments of manual actuation if a printing test by a person attending the machine.

The above mentioned and other objects, features and advantages of the invention will be apparent from the following detailed description and the accompanying drawings of an illustrative embodiment of the improved printability tester. In the drawings:

FIG. 1 is a front elevational view of the printability tester, some parts being broken away and some shown in section;

FIG. 2 is a rear elevational view thereof;

FIG. 3 is a vertical cross-sectional view taken approximately along line 3—3 of FIG. 2;

FIG. 4 is an enlarged cross-sectional view of a portion of the mechanism, taken approximately along line 4—4 of FIG. 2;

FIG. 5 is an enlarged side elevational view of an adjustable doctor mechanism provided for the machine;

FIG. 6 is a diagrammatic view of the one-print actuating mechanism in position to begin a printing impression; and

FIG. 7 is a diagrammatic view of the same mechanism acting to end an impression.

By reference to FIGS. 1, 2 and 3 it will be seen that the improved machine includes basically a rotary printing cylinder **10** having a mating impression roll **20** disposed above it at the front of a supporting frame F, with an ink fountain **40**, pre-doctor device **50** and doctor blade **60** arranged to coact with the surface **12** of cylinder **10** and a paper guide **70** arranged about the impression roll to receive and support a band S of paper or other flexible sheet material, in looped form, which is placed over this guide and thus about the impression roll **20** so as to extend freely through a gap G normally present between the cylinder **10** and roll **20**.

The printing surface **12** is formed with at least one engraved printing pattern, or intagliated image area, such as indicated diagrammatically at P in FIG. 3. Usually there will be three different printing patterns spaced apart circumferentially of the cylinder **10**, so that any one of the three may be selected for use in printability tests.

The ink fountain **40** includes a trough **41** to hold a pool of ink in which the printing surface **12** will be immersed. The trough **41** is secured tightly yet removably against the outer face of frame F by locking screws **42** and **43** which engage, respectively, into support studs **44** and **45** mounted in frame members F1 and F2. Blades **46** and **47** and doctor structures at **60** close most of the gap between the top of trough **41** and the cylinder **10**. The top of the trough also contains spring pressed side cheeks **47***a* and **47***b* (FIG. 3) which bear against the opposite side portions of the printing cylinder to prevent ink from whirling up along its sides when the cylinder is running at high speed. The fountain **40** can be filled through an open mouth **48***a* and emptied through a drain valve **48***b*. It contains a baffle **49***a* and side wall **49***b* to keep ink from splashing out of the fountain. By virtue of the side cheeks and related structures of the fountain **40**, the fountain is sealed over the ink pool so that little or no evaporation of ink solvents will occur and the ink will be maintained at the proper viscosity during printing.

The pre-doctor **50** is a blade mounted on a fixed support **52** with its forward edge spaced a slight distance away from the printing surface **12**, and having a tail portion **54** directed downward toward the outer side of baffle **49***a*. The pre-doctor blade limits the thickness of the ink film that can be carried on the surface of the printing cylinder to the location of the doctor **60**, and diverts the excess ink back and down along tail portion **54** and the outer side of baffle **49***a* into the ink supply held in the fountain trough **41**.

The doctor **60** includes a blade **61** mounted through adjustable holders **62** and **63** on a shaft **64** which is turnable and slideable relative to the frame. An arm **65** on shaft **64** is connected with a tension spring **66** extending from a support pin **67** slidably positioned in a slot in the wide wall of the frame and coacting with a calibrated plate **67***a*. A hollow stem **68** also connected with pin **67** extends through the top wall of the frame to a threaded connection with a knob **69** by which the position of pin **67**, and thus the stretch and tension of spring **66**, may be adjusted. The spring turns shaft **64** so as to hold the edge of the doctor blade against the printing surface **12** with a pressure determined by the tension setting of spring **66**. Arm **65**, however, is engageable by a rod **65***a* which will be displaced downwardly by arm **65***b* on a shaft **65***c* when a lever arm **65***d* secured to this shaft in front of the frame is moved clockwise to engage in an "OFF" detent **65***e*. The lever arm **65***d* thus serves to move the doctor blade to a position where it will remain out of engagement with the printing surface when the machine is not in use, and counter-clockwise movement of this arm releases the doctor mechanism so that the blade **61** will work with the selected pressure against the surface of the printing cylinder.

When the doctor blade **61** is in working position, its edge bearing against the printing surface scrapes off all the ink carried by that surface beyond the pre-doctor **50**, excepting only those minute portions of the ink which are held in the recessed image portions of the printing patterns.

The paper guide **70** includes a spring plate member **72** held on several support posts **73** which extend forwardly from the front of the frame F at locations spaced about the impression roll **20**. In the normal position of that roll, a loop of paper or other sheet material to be test prined may be slipped readily onto the plate **72**, to remain stationary thereon with a part of the sample extending through the gap G. As soon, however, as the impression roll is lowered to press the sample S against the printing surface, the sample will be grasped between and moved with the engaging surfaces of roll **20** and cylinder **10** for as long as the roll remains in printing position, during which interval the sample slides longitudinally about the curved outer surface of guide plate **72**.

The impression roll **20** comprises a cylindrical body **21** fixed to the forward end of a rotary shaft **22** and having an elastic cylindrical covering layer **23** of rubber or like material. The shaft **22** extends backwardly through bearing supports **24** and **25** to a backward end **26** having a driven pulley **27** fixed thereto.

The printing cylinder **10** comprises a cylindrical body **11** having an intagliated outer surface **12**, and is mounted securely on the forward end of a rotary shaft **13** (FIG. 3). This shaft extends backwardly through bearing **15** and **16** mounted in the frame members F1 and F2, and terminates in a backward end **17** which is connected for rotation with a pulley wheel **18** through an adapter flange **19** keyed to the shaft end **17** at **19***a* and through screws **19***b* which releasably interconnect flange **19** and wheel **18**.

The rotary drive system for the cylinder **10** and roll **20** includes the pulley wheels **18** and **27** secured to the backward ends of shafts **13** and **22** and an endless belt **28** which passes about the outer surface **27***a* of wheel **27** and the aligned surface **18***a* of wheel **18**, as seen in broken lines on FIG. 2, and is trained and tensioned to the desired working position by idler pulleys **29***a* and **29***b*, the latter of which is positioned adjustably by a belt tensioning device **29**. The belt **28** interconnects the shafts **13** and **22** so that they will be driven in unison and, preferably, with the surface speed of the impression roll **20** slightly lower than that of the printing cylinder **10**. The driving of the system is effected by a motor **80** mounted on a spring support **81** secured to the frame of the machine. The motor shaft carries a pulley **82** driving a V-belt **83** trained about a driven V-belt pulley **18***b* of wheel **18** on the shaft of the printing cylinder.

It will be evident that when motor **80** is running the printing cylinder and the impression roll will both be rotated, yet no printing action will occur while the impression roll remains in its normal position with a gap present between its surface and the printing surface **12**.

In order reliably to produce a single imprint, or impression, of a selected printing pattern of surface **12** upon successive paper samples placed over the paper guide **70**, the impression roll in each printing test is to be displaced to and from a position of engagement against the printing surface at moments precisely related to the rotational position of the particular pattern to be printed, and is to be held briefly in such engagement with a pressure suited to the nature of the samples being test printed. To this end, the machine is further constituted with the actuating and control mechanisms now to be described.

As seen in FIG. 2 and FIG. 4, the shaft **22** of the impression roll is supported on its bearings **24** and **25** both rotatably and eccentrically within a sleeve **30** which extends (FIG. 3) from a location in front of the frame F backwardly through bearings **31** and **32** to a backward end portion **33** located near the pulley wheel **27**. Sleeve **30** has an eccentric internal configuration and is cylindrical externally so as to be rotatable in its bearings, about their common axis at A, within the confines of a normally stationary bearing ring **34** which holds the sleeve bearings **31** and **32** in the frame members F1 and F2.

It will be evident that a small turning movement of the sleeve **30** in the counter-clockwise direction (FIG. 2) on axis A will displace the shaft **22** and the impression roll **20** thereon downwardly for forcible engagement of the roll surface against the printing cylinder, while the return movement of the sleeve will bring the impression roll back to its normal idle position.

The pressure to be applied by the roll **20** against printing surface **12** in the downward, or printing, position of the roll depends upon the given diameters of roll **20** and cylinder **10** and the distance between their respective axes of rotation. In order that this pressure may be adjusted precisely to give any desired printing condition, the sleeve **30** is supported eccentrically in the bearing ring **34**, as by providing the latter with an eccentric internal configuration where the sleeve bearings **31** and **32** are seated in it, and the bearing ring is itself supported turnably on cylindrical bearing surfaces **34***a* and **34***b* of the frame members F1 and F2. As seen in FIG. 1 and FIG. 3, an arm **35** fixed to an upper part of ring **34** is pivotally connected by pin **35***a* with a threaded coupler **36**. A screw **37** threaded into the coupler extends from it through an opening in side portion **38** of the frame to a calibrated knob **38***a* provided outside the frame F for turning the screw. A spring **39** compressed between frame portion **38** and the end of coupler **36** normally holds the arm **35** and bearing ring **34** in a fixed position determined by the setting of screw **37**. Whenever it is desired to adjust the pressure to be applied by the impression roll in printing position, the desired adjustment can be effected with precision by simply turning the calibrated knob **38***a* and screw **37** so as to turn the bearing ring **34** in the frame and thereby displace the axis A of the sleeve by a desired small distance toward or away from the axis of rotation of the printing cylinder.

For the required displacements of the roll **20** in part of a single revolution of the printing cylinder, the sleeve **30**, as seen in FIGS. 2, 3 or 4, is provided with a turnable member **90** which is suitably connected with sleeve end portion **33** to move therewith about its axis A; and a drive member **100** in the form of a ring loosely surrounding the sleeve and provided with a downwardly extending rocker arm **101** is arranged to be rocked continually about the sleeve axis in synchronism with the rotation of the printing cylinder. The drive member **100** and turnable member **90** are normally disconnected from one another so that the continual rocking movements of member **100** will have no effect. These members, however, are provided with normally inactive means, such as a pawl-like connector **92** pivoted on an ear **91** of member **90** to coact with an abutment **102** rocking with member **100**, for connecting them together to turn the sleeve **30** on its axis and thus displace the impression roll into printing position.

When the connector **92** is inactive, as it normally is because positioned outside the path of rocking movement of abutment **102** as seen in FIG. 2, the turnable member **90**, sleeve **30** and impression roll **20** are held at their normal idle position by suitable means such as a heavy tension spring **93** which is anchored at one end, as at **94**, to the machine frame and has its other end connected at **95** to an arm **96** protruding from member **90** at a location away from the ear **91**. A nose **97** on arm **96** abuts against a fixed stop **98** to limit the idle position to which member **90** and the sleeve are held by spring **93**.

When the connector **92** is shifted into the path of abutment **102**, a counter-clockwise turning of drive member **100** and abutment **102** will produce a corresponding movement of member **90** and sleeve **30** about the axis A, with a corresponding extension of the tension spring **93**; and when the connector **92** is returned to its normal inactive position, the spring **93** immediately returns member **90**, sleeve **30** and roll **20** in clockwise direction (as viewed in FIB. 2) to their idle position.

The rocking movements of drive member **100** for displacement of the impression roll are produced in constant synchronism with the rotation of the printing cylinder by means of a cam follower **104**, comprising rollers **104***a* and **104***b* fixed to the end of rocker arm **101**, and a cam track **105** comprising endless rails **105***a* and **105***b* engaged by those rollers.

The cam track rails are integrally fixed to the pulley wheel **18** for rotation therewith. The track which they form has a low region, nearer to the axis of shaft **13**, by which the cam follower and drive member **100** are turned to their extreme clockwise position, as seen in FIG. 2. The track slopes from the low region into a high region **106**, farther from that axis, by which the follower and member **100** are turned to and held briefly in their extreme counter-clockwise position. The reach of the high region **106** of the cam track is made sufficient to exceed the angular distance encompassed by each printing pattern in the surface of the printing cylinder **10**, and the wheel **18** is so oriented relative to shaft and cylinder **10** that the high region **106** will begin to position the cam follower as a certain printing pattern approaches the nip of the impression roll **20** and will leave the cam follower when that pattern has passed beyond the impression roll.

The particular printing pattern so related to the position and operation of the cam track can be selected as desired by suitably indexing the angular position of the wheel **18** relative to the shaft **13**. For this purpose, the screws **19***b* connecting adapter flange **19** with wheel **18** may be disengaged and the shaft and wheel may then be turned one relative to the other to a new angular position in which the high region of the cam track will span the angular location of the selected pattern on printing surface **12**, whereupon the screws are re-engaged with the wheel to secure the parts in this selected relationship.

While as above described the turnable member **90** is connected with the sleeve **30** for movement therewith about axis A, this connection according to a further feature of the present invention is effected through force-limiting means which serve to prevent the torque transmitted to the sleeve and roll **20** when connector **92** is active from exceeding a predetermined value suitable for protection of the machine against being overloaded, irrespective of the thickness of the test sample S or of other printing test conditions.

As seen in FIG. 2, this force-limiting means includes links **110** and **111** having ends pivotally joined together by a pin **112** on which guide rollers **113** are mounted. The other end of link **110** is pivoted at **114** to arm **96** of turnable member **90**. The other end of link **111** is pivoted at **115** to an arm **116** protruding from a ring member **117** which is fixed, as by a key **118**, to the backward end portion **33** of sleeve **30**. The rollers **113** at the joint between the links bear constantly against guide surface **120** on a lever **122** which is fulcrumed on pin **123** and is constantly urged against the rollers **113** by a tension spring **124** having one end secured at **125** to the frame and having its other end secured at **126** to the upper end of lever **122**. A guide surface **127** on box **128** fixed to the frame limits displacement of the rollers **113** and links **110** and **111** in the direction toward the sleeve **30**.

It will be evident that under normal working conditions a turning movement imparted to member **90** and its arm **96** by enagement of abutment **102** with connector **92** will

be transmitted directly through the links **110** and **111** to the ring member **117** keyed to the sleeve, with displacement of the links and rollers **113** along and between the confronting guide surfaces **120** and **127** of lever **122** and box **128**. On the other hand, if the resistance to displacement of the impression roll by turning movement of the sleeve should at any time be so great that the thrust of the links and rollers **113** against surface **120** overcomes the force of spring **124**, then the lever **122** will be displaced by the rollers **113**, with outward movement of the joined ends of the links, so as to limit the torque transmission of the links, and thus the stress applicable to the roll displacing mechanisms, to a maximum value determined by the tension of spring **124**.

The initiation of a printing test by use of the machine can be effected at any time, with the drive motor running and the ink, the doctor and a paper sample in place, by manual or other movement of a suitable actuating device. A suitable manual activator comprises a push button **130** on the outer end of a rod **131** extending slidably through a bearing **132** in frame F and connected with other parts as described hereinafter.

In order reliably to ensure that a complete single impression of the selected printing pattern only will be printed on the paper sample in each test, the test actuating means of the improved machine is provided not only with such manually operable means for initiating a printing test but also with elements which are positioned by the rocking drive member **100** so as to cause the activation and inactivation of the means for interconnecting members **90** and **100**, such as shiftable connector **92**, and thus the required displacements of the impression roll, to take place only in proper relation to the rotational position of the pattern to be printed, irrespective of the moment of operation of the push button **130** or like device.

As seen in FIG. 2, the connector **92** has an arm end **92***a* to be engaged by abutment **102** and, at the opposite side of its pivot ear **91**, has an arm **92***b* which normally is held displaced toward sleeve **30** against the force of a spring **92***c* compressed between arm **92***b* and member **90**, so that end **92***a* lies outside the path of movement of abutment **102**.

The connector is normally held in this inactive position by a retainer **140** which is pivoted on frame pin **141** and carries a cam roller **142** bearing against the outer side of arm **92***b* to hold this arm depressed. Retainer **140** also has an arm **143** at the opposite side of its pivot, which arm carries a roller **144** at its end and normally is disposed so that this roller lies just outside the path of movement of a pusher element pivoted at **107***a* to an arm **103** on the rocking drive member **100**.

A tension spring **145** anchored to the frame F constantly urges the retainer **140** in clockwise direction as viewed in FIG. 2, to bring it, when it is released, from its normal latching position to a position in which the connector **92** will become active to turn the sleeve **30** and displace the impression roll into printing position. The spring **145**, however, is normally kept ineffectual by a latch member **146** having a first notch **146***a* engaged with the end of retainer **140** so as to hold the latter in its latching position with roller **142** depressing arm **92***b* of connector **92**. The latch member **146** also has a stop notch **146***b* stepped away from notch **146***a*, which will receive the end of retainer **140** when the latter is released.

The latch member **146** is pivoted on frame pin **147** and has an outer arm **148** formed with a notched end that normally is engaged by nose **149***a* of a pawl **149** pivoted to arm **150***a* of a bellcrank lever **150**. Lever **150** also is pivoted on frame pin **147**, and its end **150***b* is connected by pivot pin **131***a* with the inner end of push rod **131**. Thus, an inward movement of rod **131** by push button **130** turns the lever **150**, pawl **149** and latch member **146** as a unit in clockwise direction about pin **147** and moves notch **146***a* of the latch member free of the end of retainer **140**, to enable a releasing movement of the retainer by spring **145** with attendant shifting and activation of connector **92**.

This potential releasing movement of the retainer, however, does not actually occur unless the printing pattern to be test printed is in a proper location of approach to the impression roll **20**, that is, unless the cam follower **104** is in the low region of the cam track **105** which, as previously stated, has a pre-set angular orientation relative to the position of that pattern. This limitation upon the release of the retainer is secured by means of coacting position control elements **160** and **161** which are fixed respectively to the retainer **140** and to an arm **108** on drive member **100**. These elements are advantageously formed as leaf spring members having mounting portions secured respectively to the base of retainer **140** and the end of arm **108** and having respective end portions which protrude freely from the mountings and are then turned back toward them, in opposite directions, so as to form tongues **160***a* and **161***a* capable of interfitting one against another.

When the drive member **100** is in its position given by the low region of the cam track, the end of spring tongue **161***a* is disposed slightly away from the end of spring tongue **160***a*; so a releasing movement of latch member **146** at that moment will allow the retainer **140** to be moved by spring **145** from its latching position to a released position in which its end will fall into the stop notch **146***b* of member **146**, as it is seen in FIG. 6. On the other hand, if the pattern to be imprinted is not in a proper location of approach to the impression roll, the drive member **100** will be in a position displaced counter-clockwise from that seen in FIG. 2, with spring tongue **161***a* engaged over spring tongue **160***a* so as to prevent the releasing movement of retainer **140** until such time as the rotation of the printing cylinder has again brought the selected pattern into a proper location of approach to the impression roll with corresponding location of the cam follower in the low region of the cam track.

Although the push button **130** often will be depressed to release the latch member **146** at a moment not corresponding to the disengaged condition of the position control elements **160** and **161**, that condition will occur quickly due to the high speed of rotation of the printing cylinder, whereupon the outward movement of the end of retainer **140** into stop notch **146***b* takes place immediately. The stop notch **146***b* then holds the latch member in released position, notwithstanding that it is constantly urged toward latched position by a tension spring **146***c*.

As the retainer **140** moves to released position the connector **92** is shifted clockwise by spring **92***c* to place its end **92***a* in the path of abutment **102**. Then the ensuing counter-clockwise movement of drive member **100**, as caused by transition of the cam follower from the low region to the high region of the cam track, acts through turnable member **90** and the parts moving with it to displace the impression roll **20** into printing position.

The impression roll **20** then is held in printing position during the limited interval of engagement of the cam follower **104** by the high region **106** of the cam track, causing a full imprint of the selected printing pattern to be made on the paper sample S. Immediately as that pattern passes beyond the impression roll, the cam track displaces the follower and drive member **100** clockwise back toward the low-cam position shown in FIG. 2. In the course of this movement the retainer **140** is returned to its latching position, thus shifting connector **92** away from abutment **102**, by the action of pusher element **107** on arm **103** against roller **144** on arm **143** of retainer **140**, and the heavy tension spring **93** immediately displaces the impression roll back to its normal idle position away from the printing surface **12**.

That resetting action of the pusher element **107** results from the fact that the preceding clockwise releasing movement of retainer **140** for activation of the connector placed roller **144** in the path of oscillation of element

107. The pusher element 107 has a cam end 107*b* and has an arm 107*c* constantly engaged by oppositely acting leaf springs 109*a* mounted on an arm portion 109 of member 100. The springs 109*a* enable the cam end 107*b* to be pivoted inward by and slid under roller 144 as it is moved counterclockwise with drive member 100, the retainer 140 being in released position. Upon the return, clockwise movement of member 100, however, the arm 103 carries cam end 107*b* into direct thrusting engagement against roller 144, so that element 107 then pushes that roller and the retainer 140 counter-clockwise, returning the retainer to its latching position. The latch notch 146*a* then is pulled over the end of the retainer by spring 146*c* to reset the retainer in latching position with its roller 142 holding connector 92 inactive.

It will be evident that if the lever 150 and latch member 146 continued to act as a unit, an attendant holding the push button 130 depressed longer than momentarily might cause more than one impression to be imprinted on the paper sample, as the latch member 146 might thus keep retainer 140 released until another activation of connector 92 causing another displacement of the impression roll had occurred.

That possibility is avoided by the action of the pawl 149 pivoted on arm 150*a* of the lever 150. As lever 150 approaches the limit of its clockwise movement by push button 130 and rod 131, a tail 149*b* on pawl 149 engages a fixed pin 149*c* which turns the pawl so as to lift its nose 149*a* out of the notched end of arm 148 of the latch member, and the lever then moves nose 149*a* over that notched end. The nose remains there, leaving the latch member 146 free to be returned to latching position by spring 146*c* when retainer 140 is moved counter-clockwise, for as long as the push button 130 is held depressed. Upon release of the push button, however, the lever 150 and rod 131 are returned to normal position by a spring 152 acting upon lever arm 150*a*, and the pawl 149 is returned by spring 153 to its normal position of engagement of nose 149 in the notched end of arm 148.

Accordingly, the improved machine operates reliably to make a single printed impression of the selected pattern on the paper sample in each printing test, irrespective of the moment when the push button 130 is pressed to initiate a printing test and of any delay in releasing the push button.

The doctor blade 61 is continually displaced axially relative to the printing surface 12 during the operation of the machine. For this purpose, a suitable drive mechanism, not shown in detail, translates the rotation of a cross shaft 172, driven from shaft 13 through worm 170 and worm gear 171, into reciprocating movement of the sliding shaft 64 of the doctor mechanism 60.

The doctor blade holders 62 and 63 provide for dual angular adjustments of the blade relative to the shaft 64, so that the blade may be adjusted to any desired angle relative to the printing surface without changing the distance of its edge from the supporting shaft. For this purpose, as shown in FIG. 5, the blade 61 is suitably clamped in holder 62 which fits turnably into cupped portion 63*a* of holder 63 and is held therein at any desired angular setting by screws 62*a* which pass into holder 62 through a slot in portion 63*a* and engage clamps 62*b* thereover. Similarly, holder 63 has an upper cupped portion 63*b* which fits turnably over the shaft 64 and is held at any desired angular setting thereon by screws 64*a* which pass into the shaft through a slot in portion 63*b* and engage clamps 64*b* thereover. Index marks on holder 62, cupped portions 63*a* and 63*b* and the end of shaft 64 enable the desired adjustments to be made readily in proper relationship one to another.

Although an illustrative embodiment of the present invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention to be protected is intended to be defined by the appended claims and is not limited to particulars of the illustrated embodiment except as may be required for fair construction of the terms of the claims.

What is claimed is:

1. Apparatus for testing printability, including a rotary cylinder having a printing pattern on its surface, means for inking the printing elements of said pattern, an impression roll normally positioned out of engagement with said surface, respective shafts carrying said cylinder and said roll thereon and mounted in a frame for rotation on parallel axes, drive means for continuously rotating said shafts, and means operable within a single revolution of said cylinder for displacing said roll into and holding it in engagement with said surface so as to press, and to cause an imprinting of said pattern upon, a sample of sheet material between said surface and said roll, and then returning said roll to normal position; wherein the last mentioned means comprise

a sleeve having the shaft carrying said roll supported rotatably and eccentrically therein,

a bearing ring holding said sleeve rotatable therewithin to displace said shaft, said ring normally being stationary in said frame,

a turnable member connected with said sleeve for movement therewith about its axis of rotation,

a drive member rocked about said axis in synchronism with the rotation of said cylinder,

normally inactive means for connecting said members together to turn said sleeve on said axis,

and actuating means including elements positioned by said drive member for activating said connecting means to turn said sleeve so as to press said roll against said surface as said pattern approaches and passes said roll and for inactivating said connecting means and causing return of said sleeve, shaft and roll to normal position when said pattern has passed said roll.

2. Apparatus according to claim 1, said sleeve being supported eccentrically in said bearing ring, said ring being turnable in said frame, and means for turning said ring therein to alter the distance between the axes of said sleeve and said cylinder and thereby precisely adjust the pressure to be applied by said roll against the material to be imprinted.

3. Apparatus according to claim 1, said turnable member being connected with said sleeve through force-limiting means which prevent the torque transmitted by said connecting means and thus the pressure of said roll against said surface from exceeding a predetermined value.

4. Apparatus according to claim 3, said force-limiting means including pivotally joined links respectively pivoted to arms fixed to said turnable member and said sleeve, a movable member limiting the path of the joint of said links, and means yieldably holding said movable member in said path with a predetermined force.

5. Apparatus according to claim 1, said connecting means comprising a shiftable connector carried by said turnable member and means also carried thereby for moving said connector to an active position in which it will be engaged by a part of said drive member to turn said sleeve and said roll into printing position, said actuating means including means normally holding said connector displaced out of the path of rocking movement of said part.

6. Apparatus according to claim 5, said holding means including a retainer movable between a latching position in which it holds said connector so displaced and a position in which it is released from said connector, means biasing said retainer toward said released position, and a latch member normally engaging said retainer to hold it in latching position, said actuating means also including means operable manually to displace said latch member out of such engagement.

7. Apparatus according to claim 6, and reset means carried by said drive member and coacting with means

on said retainer in a certain phase of the rocking movement of said drive member to return said retainer from released position to latching position and thereby inactivate said connecting means, said turnable member having means connected therewith for thereupon turning it and said sleeve in the direction to return said roll to normal position.

8. Apparatus according to claim **1**, said actuating means including means normally holding said connecting means inactive, means to initiate release of said holding means for activation of said connecting means, and position control means including an element positioned by said drive member to prevent such release except at a rotational position of said cylinder in which said pattern has the desired location of aproach to said roll.

9. Apparatus according to claim **8**, said position control means including leaf spring members respectively fixed to said separate member and a part of said holding means, said spring members having interfitting end portions which disengage at said rotational position of said cylinder and which engage together to prevent release of said holding means at other rotational positions of said cylinder.

10. Apparatus according to claim **1**, said drive means including a driven wheel on the shaft carrying said cylinder, said wheel having an endless cam track rotated

therewith, said drive member comprising a rocker arm carrying at its end a cam follower running on said track.

11. Apparatus according to claim **10**, said cylinder having a plurality of distinct printing patterns spaced apart circumferentially on its surface and its shaft being connected with said wheel by indexing means whereby the angular position of said cam track relative to said shaft and the position of said roll are selectively related to the location of any one of said patterns desired to be imprinted.

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J. REED FISHER, Primary Examiner

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