June 1, 1937. R. McC. JOHNSTONE 2,082,635

WEB CONTROL MECHANISM

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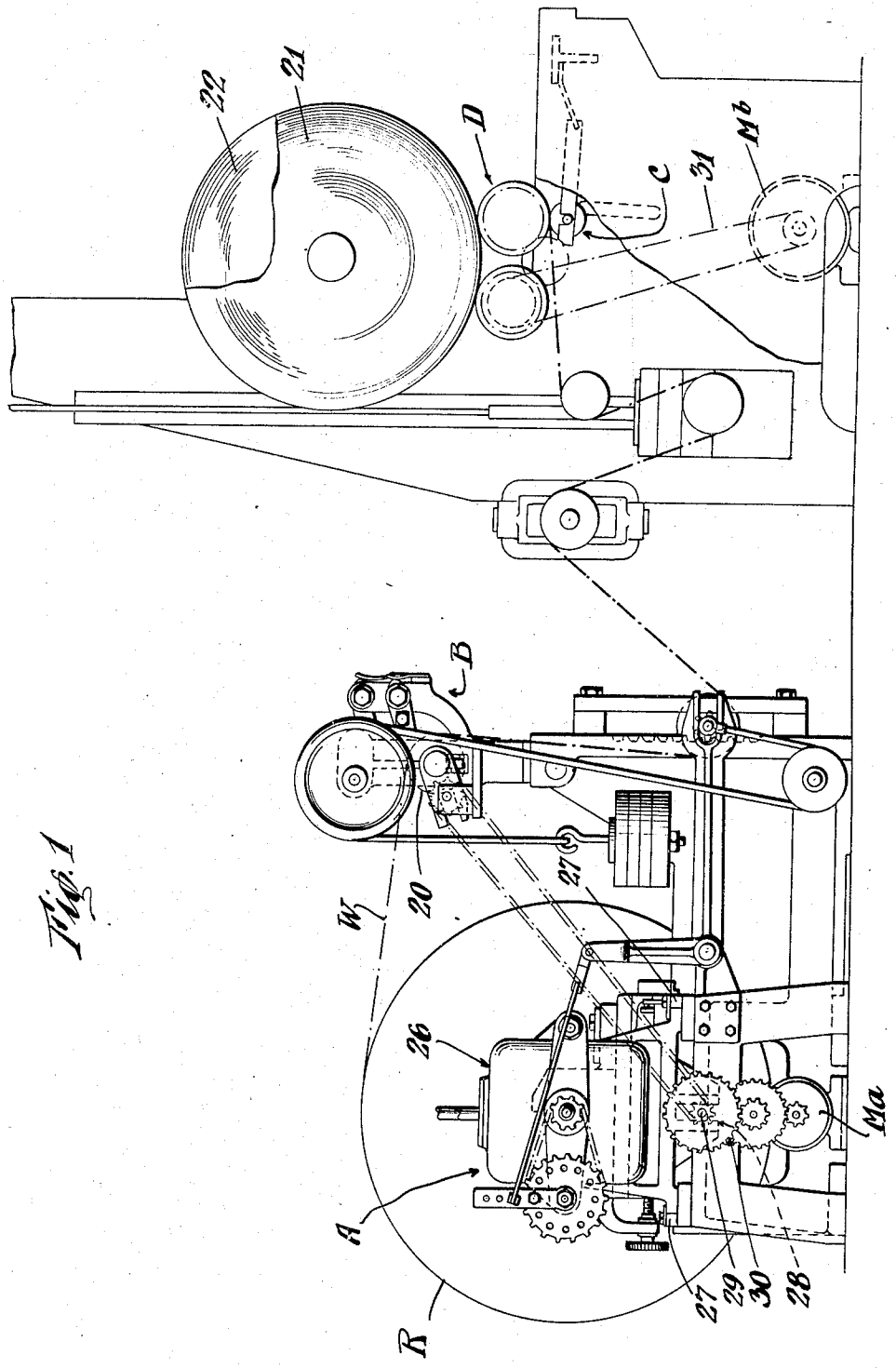


Fig. 1

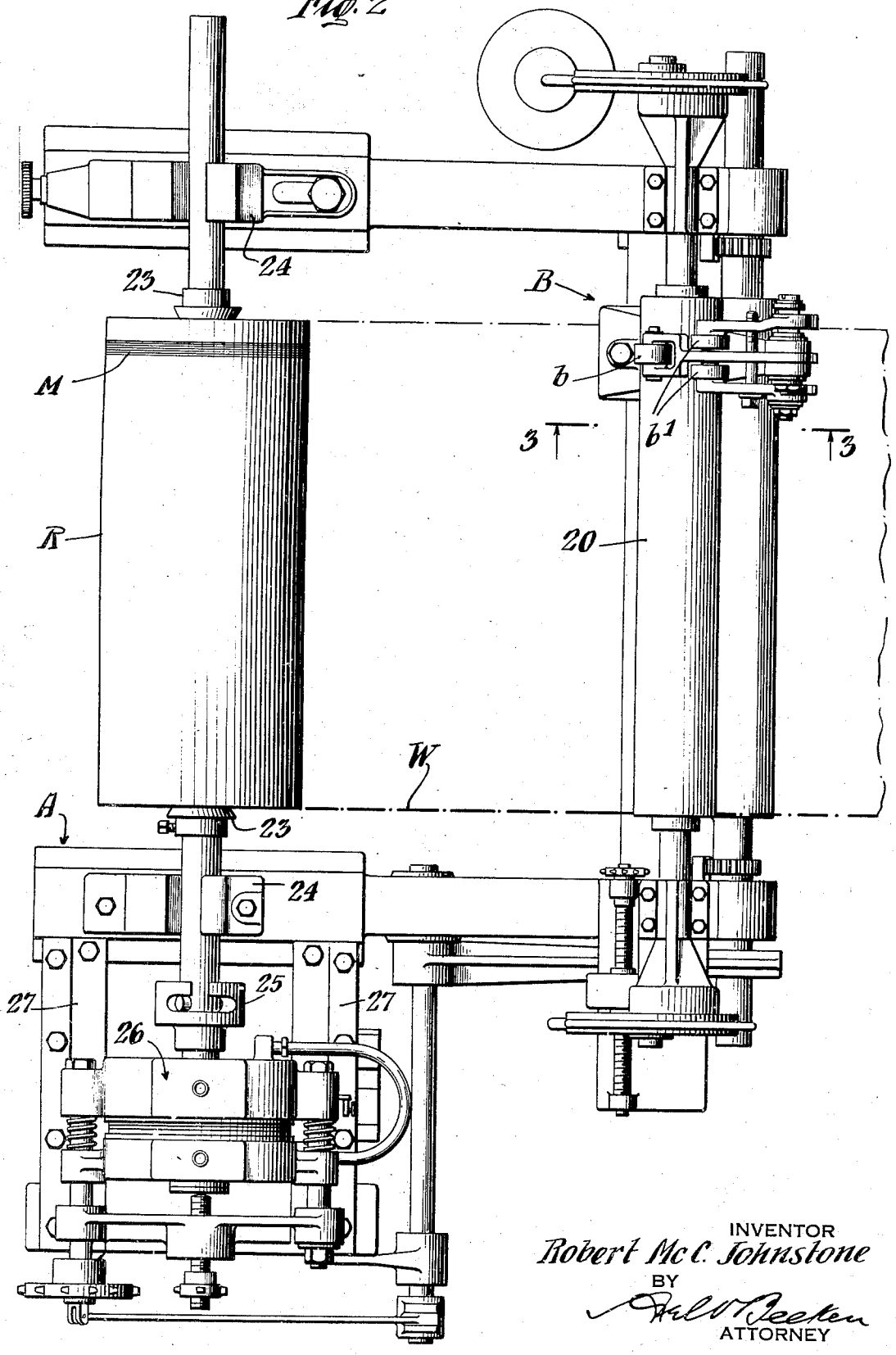
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Fig. 2



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Fig. 3

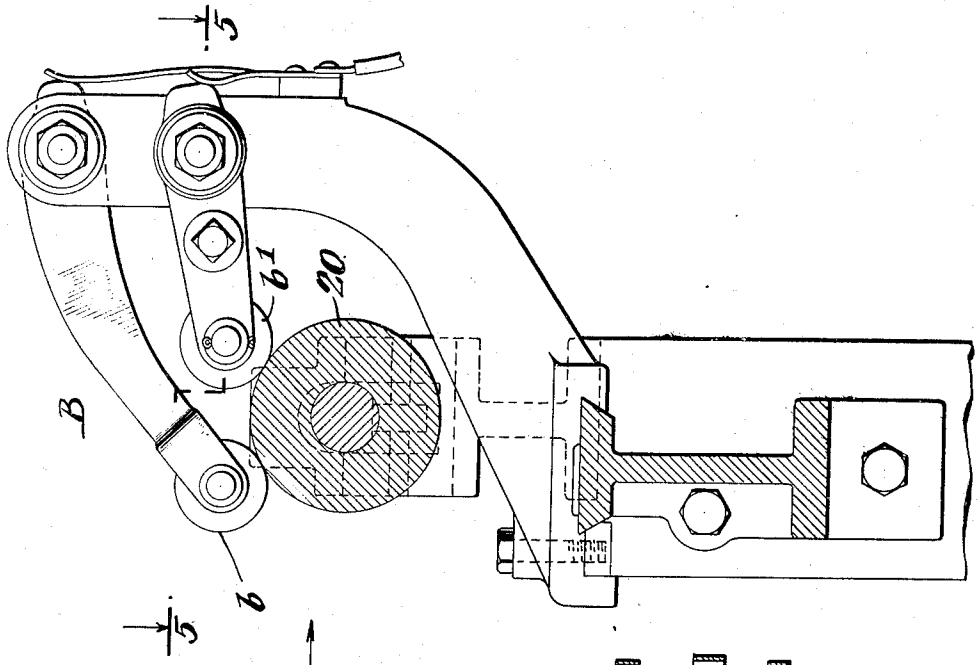


Fig. 5

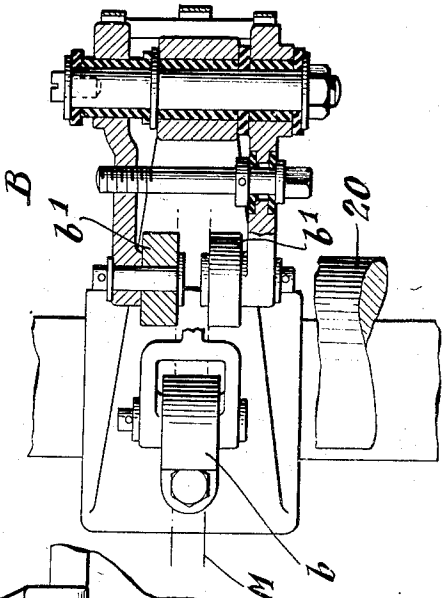
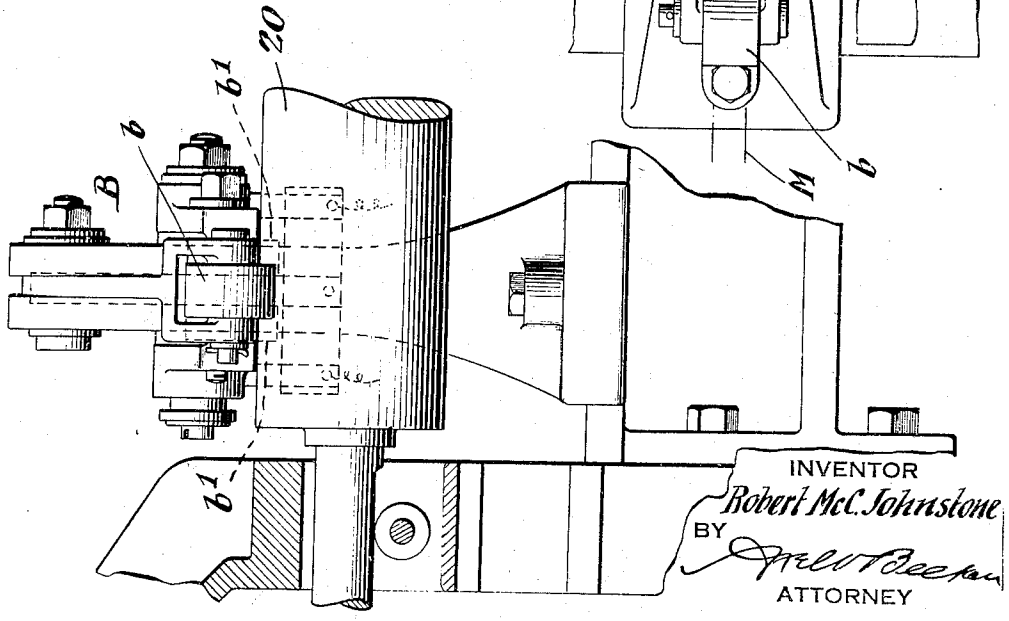


Fig. 4



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Fig. 6

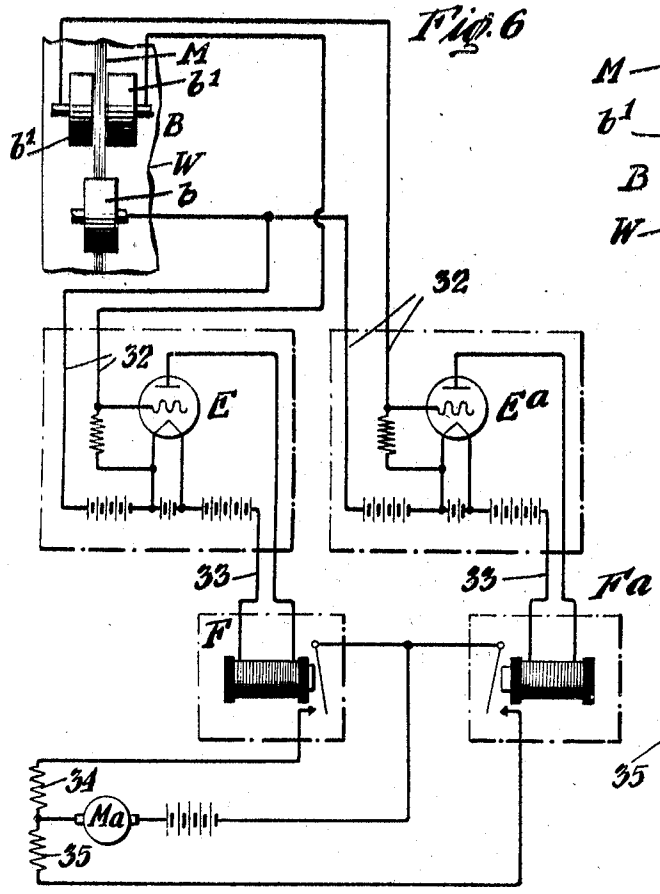


Fig. 7

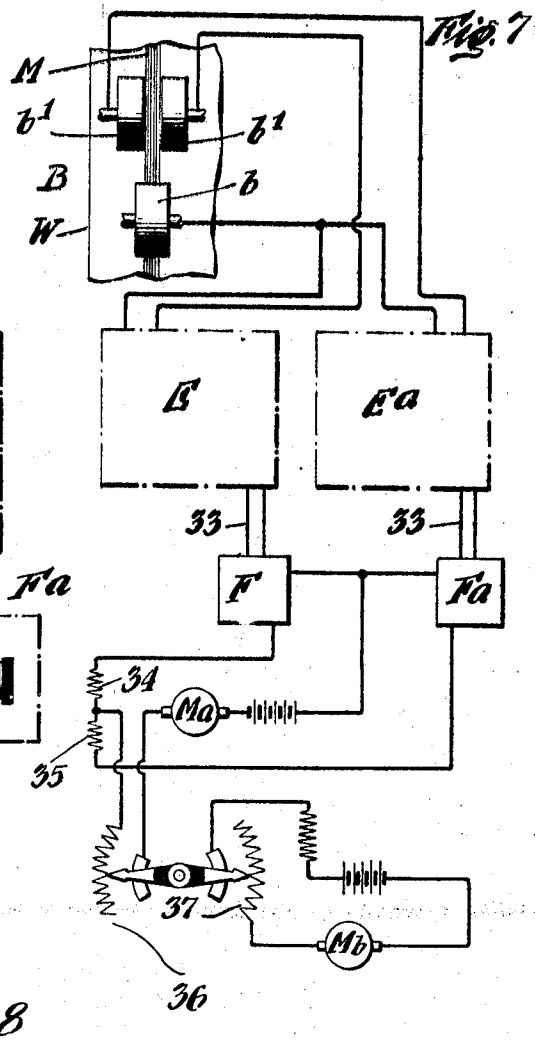
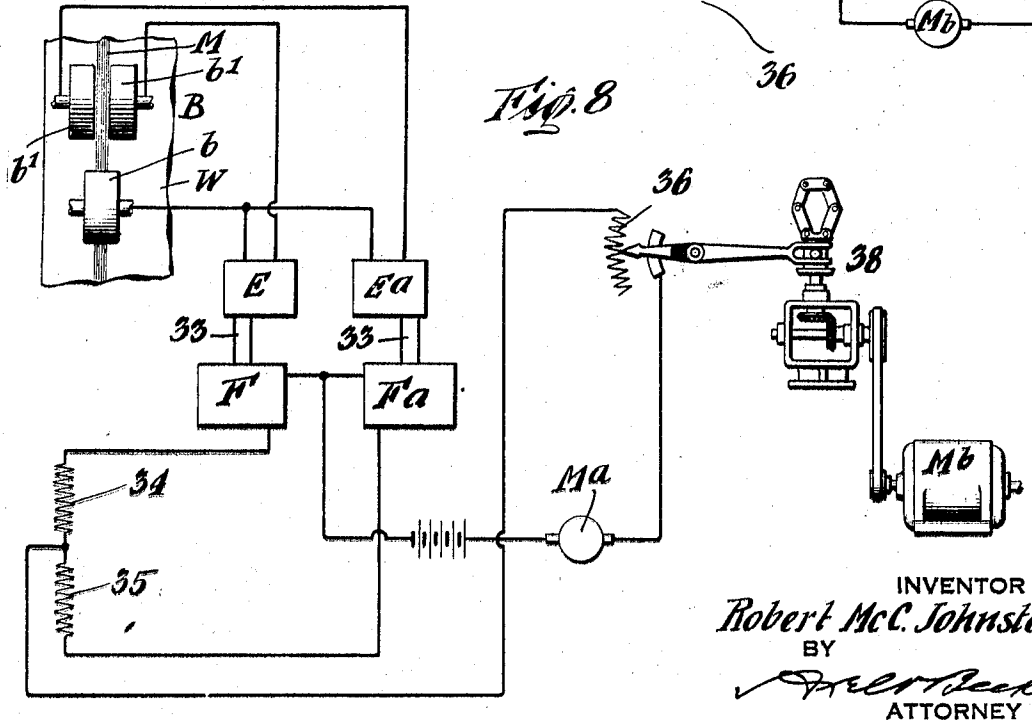


Fig. 8



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Fig. 9

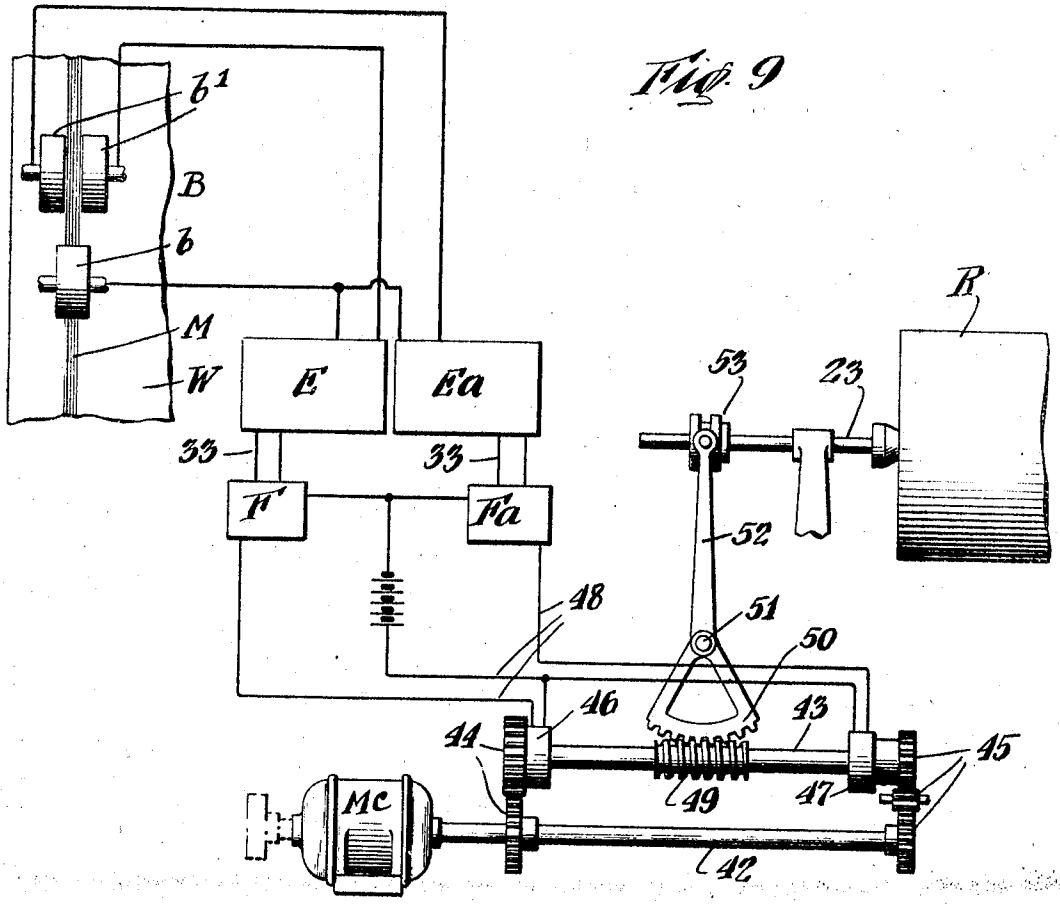
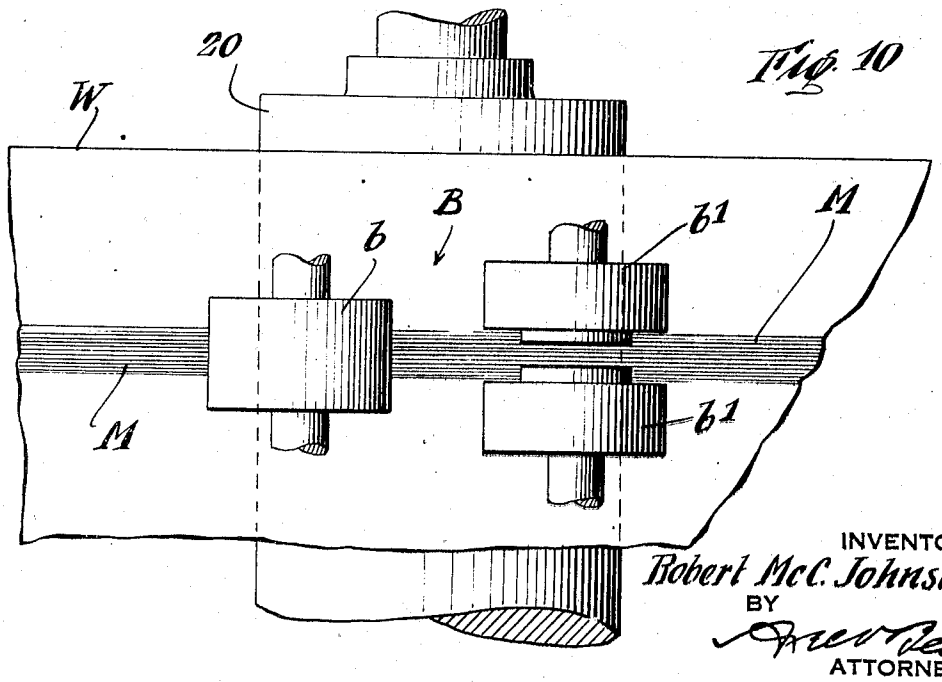


Fig. 10



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Patented June 1, 1937

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UNITED STATES PATENT OFFICE

2,082,635

WEB CONTROL MECHANISM

Robert McC. Johnstone, Short Hills, N. J., assignor to Cameron Machine Company, Brooklyn, N. Y., a corporation of New York

Application August 27, 1936, Serial No. 98,174

5 Claims. (Cl. 242—76)

This invention relates generally to electrical control systems, and has more particularly reference to a system for controlling the flow of a web of flexible material.

The main object and feature of the invention is to accurately control the side register of a web flowing at a relatively high speed from a web supply means, such as paper making machine or a rotatable reel from which the web is unwound, to a processing mechanism, such as a slitting mechanism, a winding mechanism or a printing machine. In the form of the invention here shown the processing mechanism is a slitting and winding machine.

Other objects and features of invention will appear as the specification proceeds.

In the accompanying drawings the invention is disclosed in several forms, in which

Fig. 1 is a view in side elevation of a web roll supporting means and slitting and winding machine, embodying one form of the invention;

Fig. 2 is a top plan view of the web roll supporting means;

Fig. 3 is a detail sectional view substantially on the plane of line 3—3 of Fig. 2;

Fig. 4 is a view looking in the direction of arrow 4 of Fig. 3;

Fig. 5 is a sectional view substantially on the plane of line 5—5 of Fig. 3;

Fig. 6 is an electrical diagram showing one form of circuit means to control a reversible motor;

Fig. 7 is a view similar to Fig. 6 showing an interrelated speed control system between the winding machine motor and the reel shift motor.

Fig. 8 is a view similar to Fig. 7 showing a modified speed control system.

Fig. 9 is a view similar to Figs. 7 and 8 but shows system wherein a single motor drives both the winding machine and the reel-shift mechanism.

Fig. 10 is a detail view showing a portion of the web with a longitudinal zone of conductive material together with the contact members therefor.

The web roll supporting means or reel stand is shown at A, the circuit control means at B, the slitting mechanism at C and the winder at D. A web of flexible material W passes from web roll R over a non-rotatable member 20 adjacent circuit control means B and over various rollers to slitting mechanism C and thence to the winding mechanism where the slitted sections are wound into rolls 21 and 22, the number of which will vary with the number of slitted sections produced. The means to support web roll R comprises essentially a shaft or chucks 23 to engage the core of the roll, which chucks are supported in bearings 24 in which they are both rotatable and slidable. One of the chucks 23 is connected by coupling 25 to a slidable member 26, which in this instance, is a brake mechanism to control the speed of rotation of roll R. Member 26 is mounted in guides 27 and carries an internally threaded bushing 28 with which engages a threaded rod 29, the latter capable of rotation but not of endwise movement. *Ma* indicates a reversible motor here of the direct current type, and 30 indicates transmission means between motor *Ma* and threaded rod 29. It will be understood that the means just described constitutes a mechanism for shifting the roll support or reel transversely of the direction of the flow of web W from roll R and that, when motor *Ma* is energized, the supply reel will be moved transversely, its direction of movement depending upon the direction of rotation of the motor. For a mere detail description of the roll stand equipment above outlined, my application Ser. No. 37,494, filed August 23, 1935, may be consulted.

Slitting mechanism C may be of any suitable type such as power-driven, overlapping shears or, as here shown, they may be of the score-cut type that engage with a smooth-faced roller, here conveniently one of winding drums D, and are rotated by frictional engagement therewith.

So likewise the winding means may be of the center-wind type in which power is applied to the center of rolls 21 and 22 or, as here shown, surface winding drums D may be utilized. These drums are here driven in the same direction by a motor *Mb* through suitable transmission means 31. It will be understood that the winder acts as a web pulling machine to unwind the web from roll R.

Slitting and winding machines are now being operated at very high speeds, as much as a flow of a thousand feet, and over, of web per minute, and the control of a web at such a speed is no mean task. It will be understood that due to imperfections in the web and in the feeding thereof, it is difficult to maintain proper side-register of the web with respect to the slitting and winding means, and that therefore extremely sensitive and rapid-action means must be employed to maintain such side-register. The above difficulties are increased when the web to be slitted carries a printed design, for the slitting action must then take place in definite relation to such printed design, and it therefore becomes not only desirable but practically necessary to feed

the web in a substantially undeviating path with respect to the slitters.

In order to overcome the difficulties web W carries a body of conductive material M arranged to form a longitudinal zone. In case web W is paper, body or zone M can be a line of metallic ink; and, if web W is of textile material, body M can be one or more metallic strands or one or more strands of conductive material. Circuit control means B (Fig. 10) consists here of three contact members; one, *b*, arranged normally to engage body or zone M, and two others, b^1, one on each side of zone M and normally out of contact therewith. So long as the web runs straight, no circuit will be established between *b* and b^1 but, so soon as the web deviates sidewise from its proper path, one or the other of contact members b^1 will engage zone M and a circuit will be established to control energization of motor M*a* and thus the direction of movement of the reel-shifting mechanism to thereby maintain zone M in a definite path with respect to the slitters. The circuit means to accomplish this may take many forms. In Fig. 6 are shown two relays F and F*a*, one of which, F, controls a circuit through one winding **34** of motor M*a*, and the other of which, F*a*, controls a circuit through the other winding **35** of motor M*a*. It will be apparent that contact member *b* can be directly connected to both of the relays F and F*a*, and that one contact member *b'* can be directly connected to F, and the other contact member *b'* to F*a*, so that relays F and F*a* will be controlled by a circuit established through zone M. In the present instance, it is preferred to interpose amplifying means which here take the form of the familiar three-element electron tubes E and E*a*, the grid-filament circuits **32** of which are connected to contact members *b* and *b'*, and the plate circuits **33** of which are connected to relays F and F*a*. When zone M remains in its predetermined path, the armatures of relays F and F*a* are in their open position and motor M*a* remains de-energized; but if zone M shifts sidewise, then one or the other of the armatures of F and F*a* will move into closed position and will energize motor M*a* through winding **34** or **35**, as the case may be, and will cause said motor to rotate in a direction appropriate to operate the reel-shift mechanism through the mechanical connections previously described so as to bring zone M back to its proper path, after which motor M*a* is again de-energized.

It will be understood that, if the speed of the winder which pulls the web is high, the shifting movement of the reel should be correspondingly high, and that if the winder runs slowly said shifting movement should be correspondingly slow. In Fig. 7 is shown a system in which the speed of motors M*a* and M*b* can be coordinated. The arrangement of the parts is the same as in Fig. 6, except that a speed control element, here conveniently represented by rheostat **36**, is interposed in the circuit of motor M*a*, and another speed control element, here represented by rheostat **37**, is interposed in the circuit of winding motor M*b*. The two rheostats are connected so that when the speed of the winding motor is changed, the speed of the reel-shift motor is likewise changed.

In Fig. 8 is shown a modification of the system shown in Fig. 7, in which rheostat **36** is controlled by a speed governor **38** driven by winding motor M*b*.

It is not necessary to use a reversible motor to actuate the reel-shift mechanism. In Fig. 9, Mc indicates a unidirectional motor which can be continuously running and drives a shaft **42**. Two trains of connections extend from shaft **42** to another shaft **43**, one **44** driving said shaft **43** in one direction and another **45**, having an intermediate gear, driving shaft **43** in the opposite direction. Each of the transmission connections **44** and **45** include a magnetic clutch **46** and **47**. Circuit breakers F and F*a*, instead of controlling the motor circuit, control the two magnetic clutches by means of a circuit **48**, so that when zone M runs true both clutches are disengaged but when the zone deviates from its true path one or the other of the clutches is engaged and shaft **43** is driven in the appropriate direction. Shaft **43** carries a worm **49** engaging a sector **50** pivoted at **51**, and sector **50** is provided with an arm **52** bifurcated at its upper end to engage a collar **53** on roll support **23** so as to shift the web roll in the apportionate direction. One of the advantages of this construction is that the same motor Mc can also be used to operate the winder.

I claim:

1. The method of controlling the side register of a flowing web of flexible material which consists in: providing the web with a longitudinally extending zone of conductive material, utilizing said zone as a part of a circuit, and controlling sidewise movement of the web by said circuit.

2. The method of controlling the side register of a flowing web of flexible material which consists in: providing the web with a longitudinally extending zone of conductive material, establishing a circuit through said zone when the web deviates sidewise from its proper path, and effecting a compensating sidewise movement of the web in response to the establishing of said circuit.

3. In a system for controlling the side register of a flowing web of flexible material, mechanism to shift the web sidewise; and circuit means, including a body of conductive material carried by said web and arranged to form a longitudinal zone, to control the mechanism aforesaid.

4. In a system for controlling the side register of a flowing web of flexible material, mechanism to shift the web sidewise; a body of conductive material carried by said web and arranged to form a longitudinal zone; a contact member to normally engage said zone; two other contact members one on each side of the zone, normally out of contact with the zone but adapted to engage the latter when the web deviates sidewise from its proper path to thereby establish a circuit with the first mentioned contact member; and means connected to the contact members to control the mechanism aforesaid.

5. In a system for controlling the side register of a flowing web of flexible material, mechanism, including an electric motor, to shift the web sidewise; and circuit means, including a body of conductive material carried by said web and arranged to form a longitudinal zone, to control the motor aforesaid.

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