

April 9, 1940.

R. McC. JOHNSTONE

2,196,633

CONTROLLING FLOWING WEB

Filed March 23, 1939

7 Sheets-Sheet 1

Fig. 1.

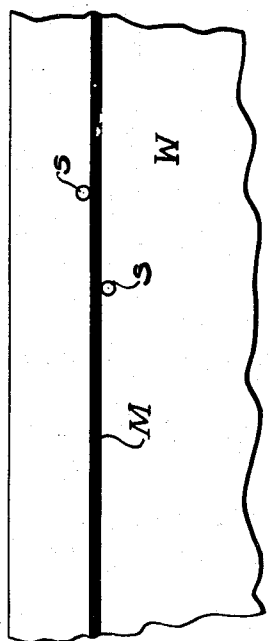
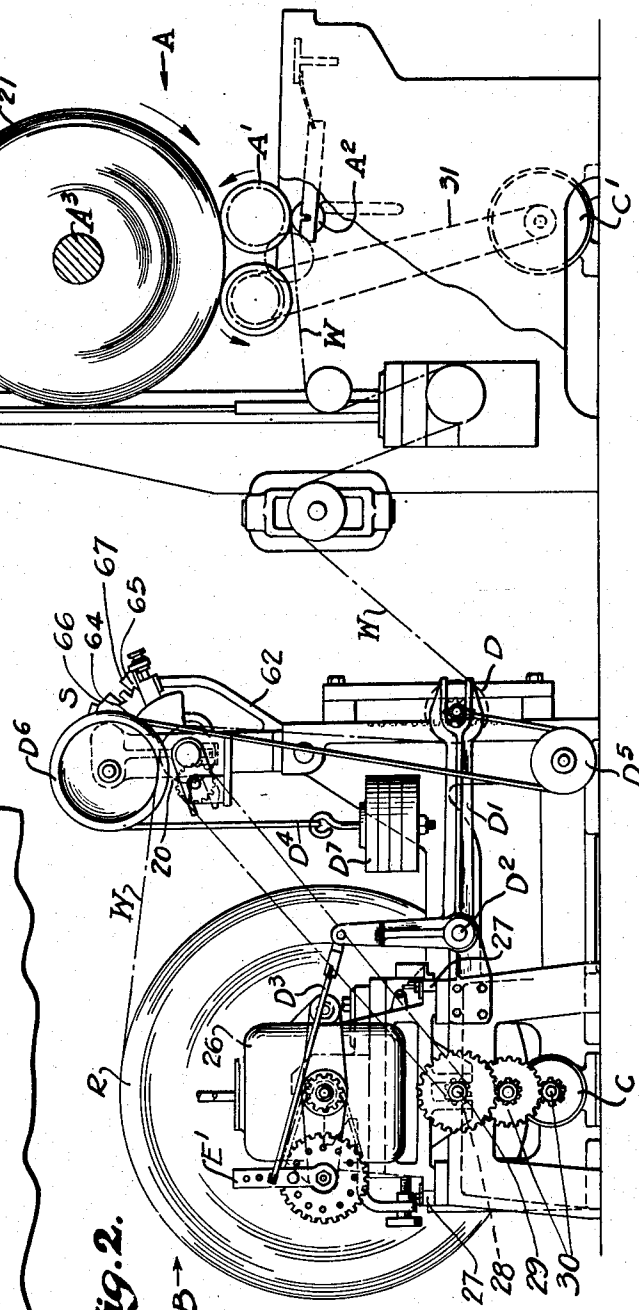


Fig. 2.



INVENTOR.

Robert McC. Johnstone

BY

Paul W. Becken

ATTORNEY.

April 9, 1940.

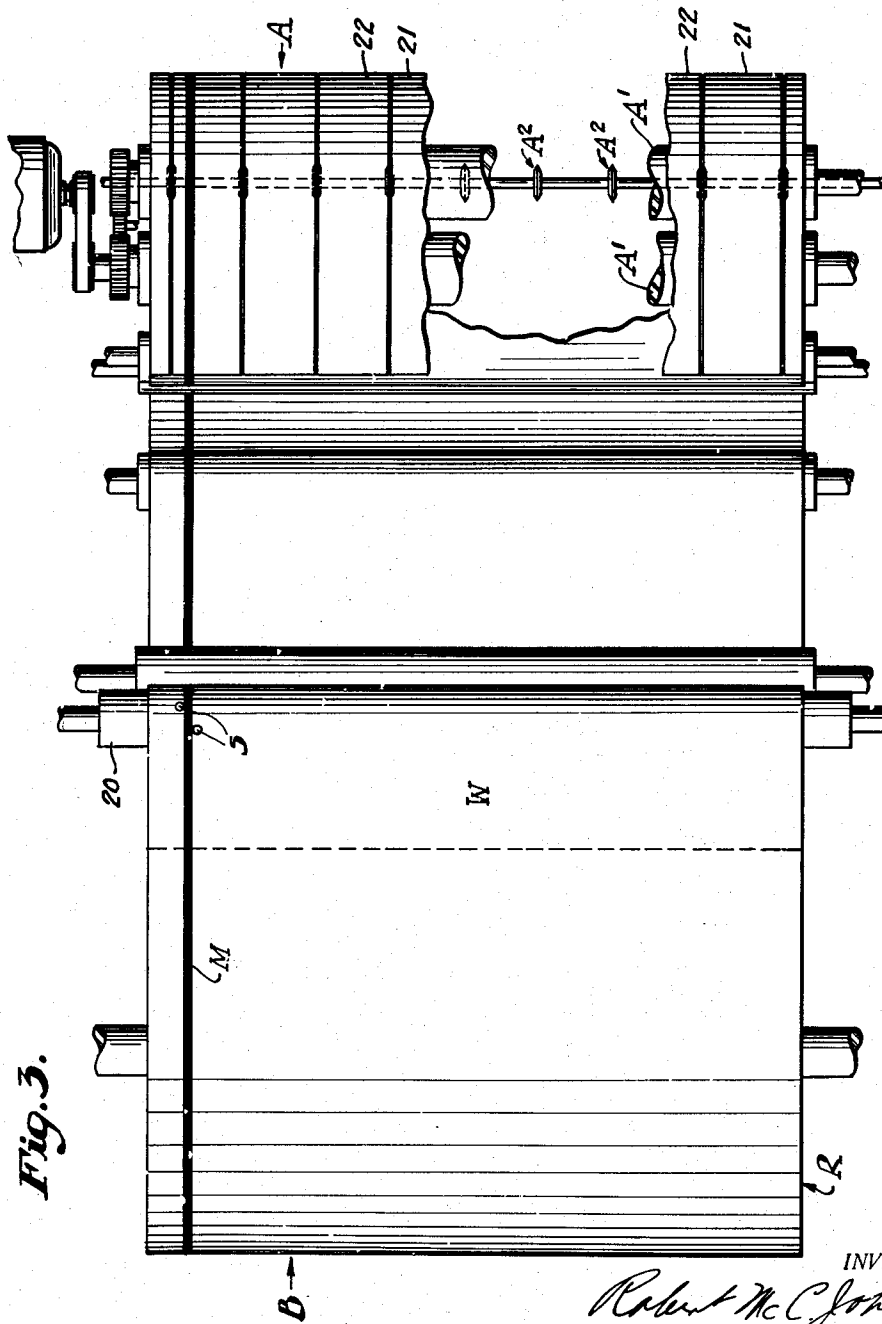
R. McC. JOHNSTONE

2,196,633

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INVENTOR.

BY *Robert McC. Johnstone*

BY

Arlo Becken

ATTORNEY.

April 9, 1940.

R. McC. JOHNSTONE

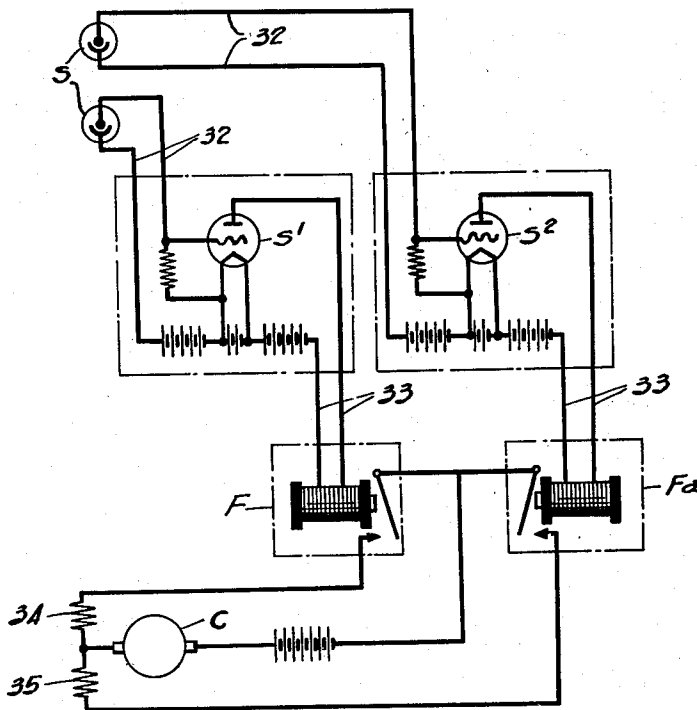
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Fig. 4.



INVENTOR.
Robert McC. Johnstone
BY
Edw. Becken
ATTORNEY.

April 9, 1940.

R. McC. JOHNSTONE

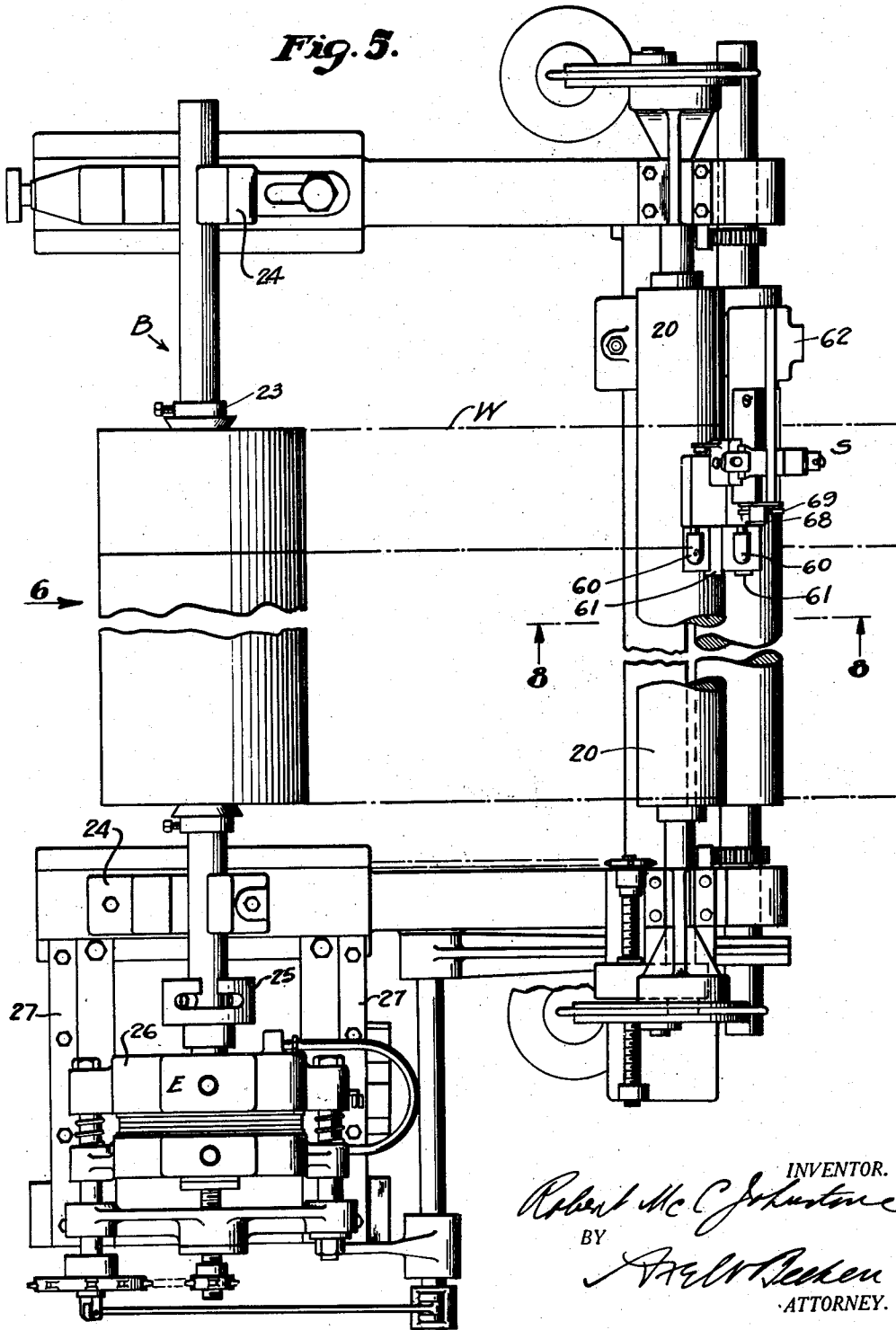
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CONTROLLING FLOWING WEB

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Fig. 5.



INVENTOR.
Robert McC. Johnstone
BY
Frederick W. Becken
ATTORNEY.

April 9, 1940.

R. McC. JOHNSTONE

2,196,633

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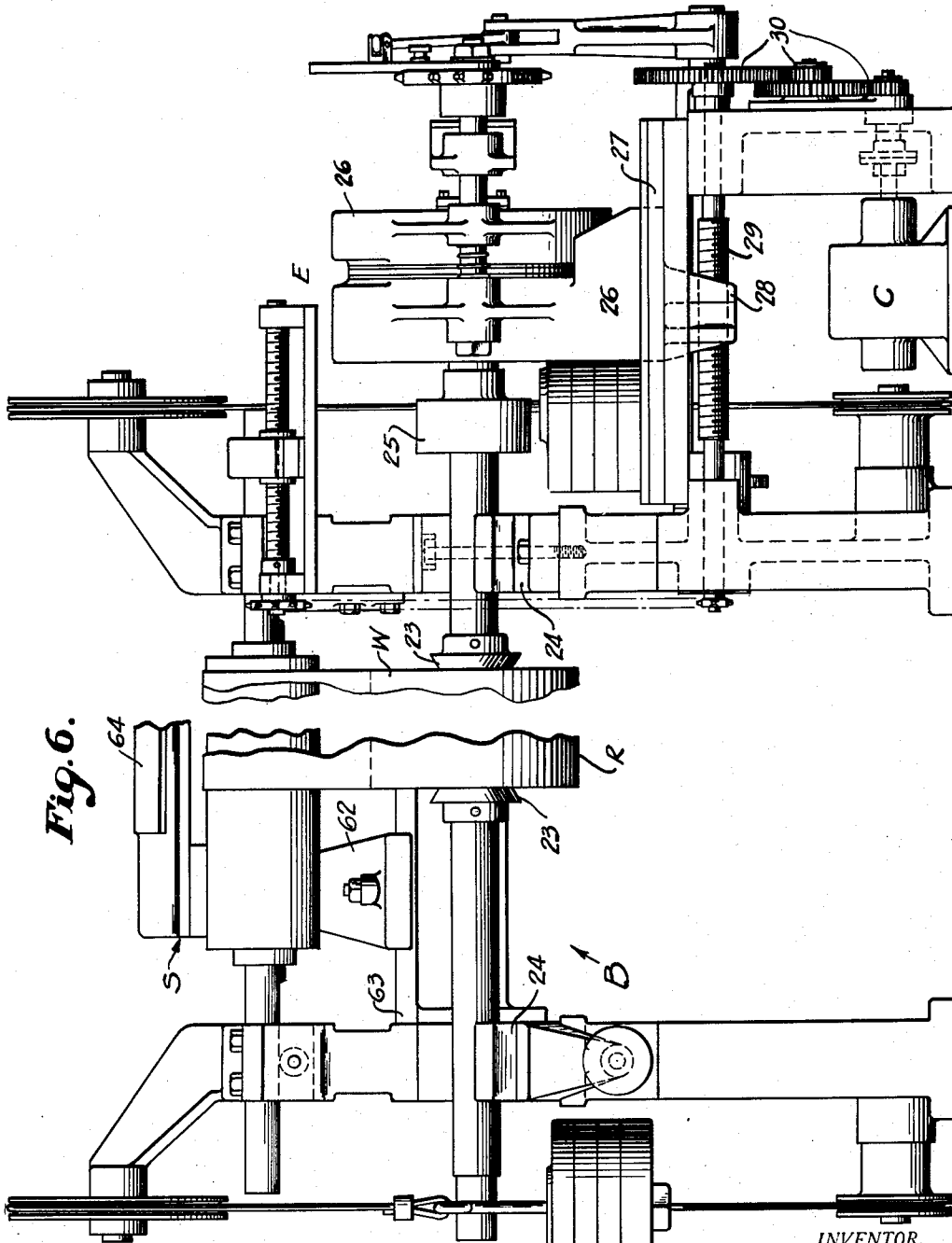


Fig. 6.

INVENTOR.
Robert McC. Johnstone
BY
H. W. Meek
ATTORNEY

April 9, 1940.

R. McC. JOHNSTONE

2,196,633

CONTROLLING FLOWING WEB

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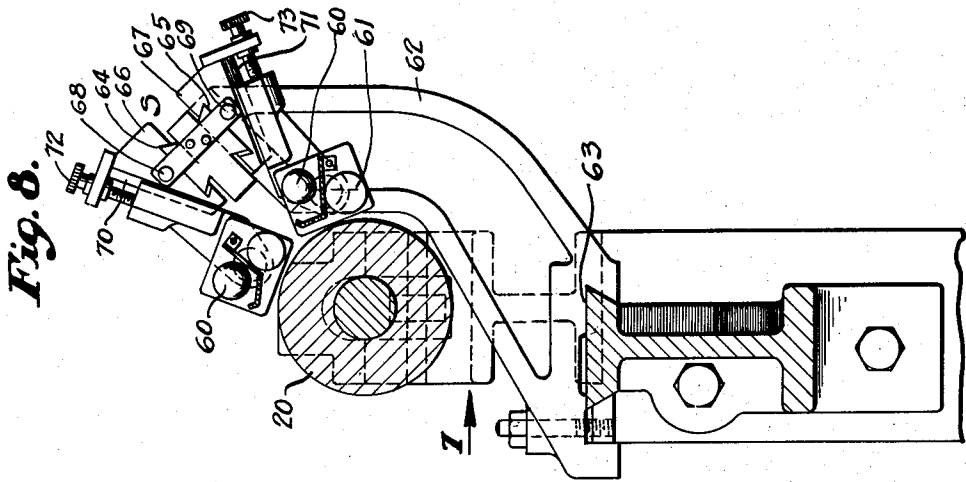
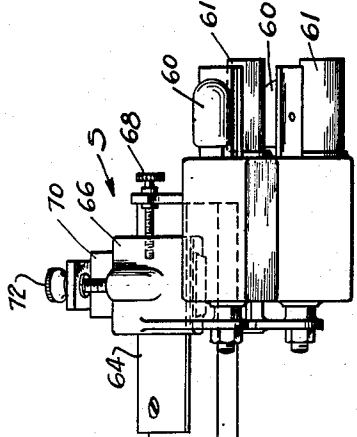
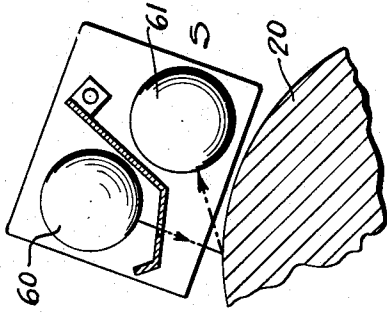
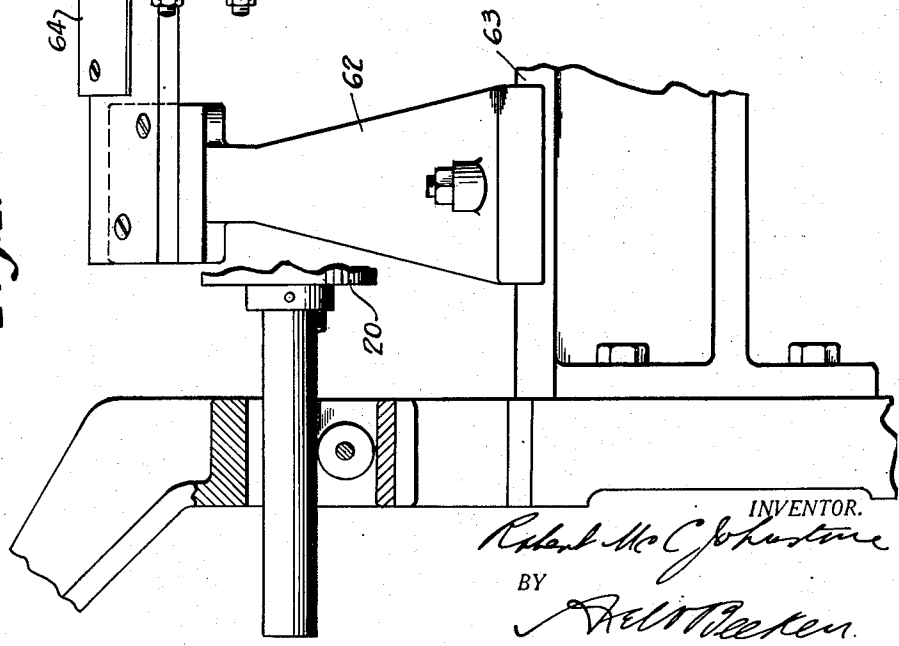


Fig. 9.



INVENTOR.
Robert McC. Johnstone
BY
Edw. W. Kenner
ATTORNEY.

UNITED STATES PATENT OFFICE

2,196,633

CONTROLLING FLOWING WEB

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

Application March 23, 1939, Serial No. 263,668

2 Claims. (Cl. 242—76)

This invention relates to the control of a flowing web in a machine in which a processing mechanism receives the web from a web roll carried by a rotatable reel, and in which said reel is provided with motor means to shift the reel in either direction transversely of the web flow. The main object and feature of the invention is to feed a flowing web to a processing mechanism more accurately as regards side register and with greater facility than has heretofore been possible in high speed machines.

In the accompanying drawings the invention is disclosed in a concrete and preferred form in which

Fig. 1 is a fragmentary plan view of a web section showing a longitudinal marking and with scanners arranged to scan opposite side edges of the marking;

Fig. 2 is a view in side elevation, with parts broken away of a roll supporting means or reel together with a slitting and winding machine;

Fig. 3 is a diagrammatic plan view of the parts shown in Fig. 2;

Fig. 4 is a wiring diagram showing one method of controlling the reversible motor for the reel shift mechanism from the scanners;

Fig. 5 is a top plan view of the parts at the left-hand side of Fig. 2 with parts broken away;

Fig. 6 is a view looking in the direction of arrow 6 of Fig. 5;

Fig. 7 is a view looking in the direction of arrow 7 of Fig. 8;

Fig. 8 is a sectional view substantially on the plane of line 8—8 of Fig. 5;

Fig. 9 is a detail view of the scanners; and

Fig. 10 is a diagrammatic view of the different paths the web may take owing to major characteristics therein.

By "processing mechanism" is meant any mechanism, such as a printing machine, that will perform an operation on the web. In the present instance, A indicates the processing mechanism which here is a slitting and winding machine of the well-known score-cut and surface-rewind type. B is a reel provided with a motor means C (here electric) to shift reel B and thereby web roll R in either direction transversely of the flow of web W from roll R to processing mechanism A. The reel is further provided with means to keep the flowing web under substantially constant tension, here represented by roller D that controls variable brake E of the reel. S is a control device located intermediate the reel and the processing mechanism which responds to transverse shifting of the web and by suitable transmission

means actuates the motor means to compensate for deviations of the web by shifting the reel and therefore the web roll. As shown, said control device is electric in character and is specifically a source of light and a light-responsive device, conventionally known as an electric eye or scanner. This control device is adjustable transversely of the flowing web, and can respond either to transmitted or to reflected light.

I have found that webs of flexible material, such as paper, have certain major characteristics that will vary in different web rolls. For instance, in one roll one side of the web may be longer or softer than the other while in another roll the converse may be true. Theoretically web W should pass in a straight line X (Fig. 10) from roll R to processing mechanism A. But if, for example, one side of the web is longer than the other then I have found that by placing the web under a given tension longitudinally, which can be varied to suit different conditions or materials, a web path such as Y or Z will be established due to the major characteristics of the web when placed under tension. By adjusting control device S transversely of the flow of the web so that for example a printed line on the web intersects it and by maintaining the web substantially constantly under said given tension, there will remain only minor characteristics in the web to be compensated for. Such minor characteristics may be due to soft spots, difference in thickness, or other minor irregularities that do not extend throughout the web or through a substantial portion thereof. Control device S will then respond to shifting of the web, due to variations in minor characteristics thereof, from the path established by the major characteristics of the web when under tension. I have found that by thus distinguishing between the major and minor characteristics of the web, a more accurate and facile control of the side register of the web is obtained.

A more detailed description of the apparatus by which the invention is carried out is as follows:

A web of flexible material W passes from web roll R over a non-rotatable member 20 adjacent the scanners and over various rollers to slitting mechanism A 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 ro-

tatable 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. C indicates a reversible motor, here of the direct current type, and 30 indicates transmission means between motor C 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 C is energized, the supply reel will be moved transversely, its direction of movement depending upon the direction of rotation of the motor. The roll stand equipment above outlined is not claimed herein but forms the subject matter of a separate application Ser. No. 37,494, filed August 23, 1935, now Patent No. 2,082,633.

Slitting mechanism A may be of any suitable type such as power-driven, overlapping shears or, as here shown, they may be of the score-cut type having discs A2 that engage with a smooth-faced roller, here conveniently one of winding drums A1, 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 A1 may be utilized. These drums are here driven in the same direction by a motor C1 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.

Scanners S can be arranged to scan the side edge or edges of the web or a printed line on the web, and they can respond either to transmitted or to reflected light. As here shown web W is supplied with a longitudinal marking M of a shade or color contrasting with that of the web, so as to modify the reflecting qualities or the translucency of that portion of the web carrying the marking. The marking may consist of one or more lines, and may be continuous or interrupted. Scanners S are so arranged here as to scan the side edges of the line, and the light sources can be arranged either to transmit light to the photo-electric cells through the material, or to impinge on the material in such a way as to reflect the light to the photo-electric cells as will be apparent. The action of the scanners is then utilized to control the energization of motor C, and thus the direction of movement of the reel shifting mechanism, to thereby maintain marking M in a definite path with respect to the slitters. The circuit means to accomplish this may take many forms. In Fig. 4 are shown two electric or electron discharge devices S1 and S2 which take the familiar form of three-element electron tubes, the grid-filament circuits 32 of which are connected to the photo-electric cells of scanners S. F and Fa indicate two circuit breakers controlled by the plate circuits 33 of devices S1 and S2. Circuit breaker F controls a circuit through one winding 34 of motor C, and circuit breaker Fa controls a circuit through the other winding 35 of said motor. When marking M remains in its predetermined path, the armatures or circuit breakers F and Fa are in their open position and motor C

remains deenergized; but, if marking M shifts, then one or the other of the armatures of F and Fa will move into closed position and will energize motor C either through winding 34 or 35 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 marking M back to its proper path, after which motor C is again deenergized.

As previously pointed out, scanners S are located adjacent to member 20. Preferably these scanners, each of which consists of a light source 60 and a photo-electric cell 61, are carried by a bracket 62 transversely adjustable on guide 63 so that both scanners are adjustable transversely in unison. Bracket 62 carries guides 64 and 65, each scanner being slidably mounted by means of slides 66 and 67 and independently adjustable transversely by means of screws 68 and 69. Slides 66 and 67 carry supplemental slides 70 and 71 by means of which the scanners can be independently adjusted toward and away from member 20 by rotating screws 72 and 73.

In operating the machine, web W is threaded over stationary roller 20, beneath floating roller D, over various rollers to slitting mechanism A2 and thence over winding drums A1 to winding shaft A3. The web is unwound from roll R by the pull of the winding mechanism and, if roll R is unwinding the web faster than it is taken up by the winding mechanism, roller D falls and takes up the slack in the web and at the same time applies the brake E more firmly to thereby retard rotation of the shaft of roll R. If, on the other hand, roll R is unwinding the web more slowly than it is taken up by the winding mechanism, roller D rises thereby releasing brake E and permitting roll R to unwind more rapidly. The web is thus kept under substantially constant tension longitudinally and a path of said web, with respect to slitters A2, will thereby be established that will be determined by the major characteristics of the web under tension. Scanners S can then be adjusted transversely of the flow of the web to conform to the path thus established and will, thereafter, compensate for shifting of the web, due to variations in minor characteristics, by exercising a control over motor C.

Roller D is mounted on a bell-crank D1 pivoted at D2 and connected by rod D3 to brake lever E1. The brake can be of any suitable construction such as shown for instance in Patent No. 2,082,633 of June 1, 1937. Connected to bell-crank D1 is a flexible connection D4 that passes beneath roller D5 and over sheave D6. The end of said flexible connection carries weights D7 that can be increased or diminished to suit the circumstances to thereby cause roller D to rest on the web with proper pressure.

A machine by means of which the invention of this application can be carried out is disclosed in Patent No. 2,082,634 of June 1, 1937, but the invention of this application is not disclosed or claimed therein.

I claim:

1. In a machine in which a processing mechanism receives a web of flexible material from a web roll that is automatically shifted in either direction transversely of the web flow in response to the action of a control device located intermediate the processing mechanism and the web roll, the method of controlling the flow of the web through the processing mechanism which consists in: subjecting the flowing web to a given

5 tension longitudinally to thereby establish that
path of flow thereof, with respect to the process-
ing mechanism, which results from major char-
acteristics of the web when so tensioned; posi-
tioning the control device transversely of the flow
of the web to accord with the path of flow thus
established; and thereafter maintaining the web
substantially constantly under said given tension
to thereby substantially maintain said path of
10 flow and to admit of transverse shifting of the
web roll by the control device in response to
lateral shifting of the web due to variations in
minor characteristics of said web.

15 2. In a machine in which a processing mecha-
nism receives a web of flexible material from a
web roll that is automatically shifted in either
direction transversely of the web flow in response
to the action of a scanning device located inter-

mediate the processing mechanism and the web
roll, the method of controlling the flow of the web
through the processing mechanism which cons-
ists in: subjecting the flowing web to a given
tension longitudinally to thereby establish that
5 path of flow thereof, with respect to the process-
ing mechanism, which results from major char-
acteristics of the web when so tensioned; posi-
tioning the scanning device transversely of the
flow of the web to accord with the path of flow
10 thus established; and thereafter maintaining the
web substantially constantly under said given
tension to thereby substantially maintain said
path of flow and to admit of transverse shifting
of the web roll by the scanning device in response
15 to lateral shifting of the web due to variations in
minor characteristics of said web.

ROBERT McC. JOHNSTONE.