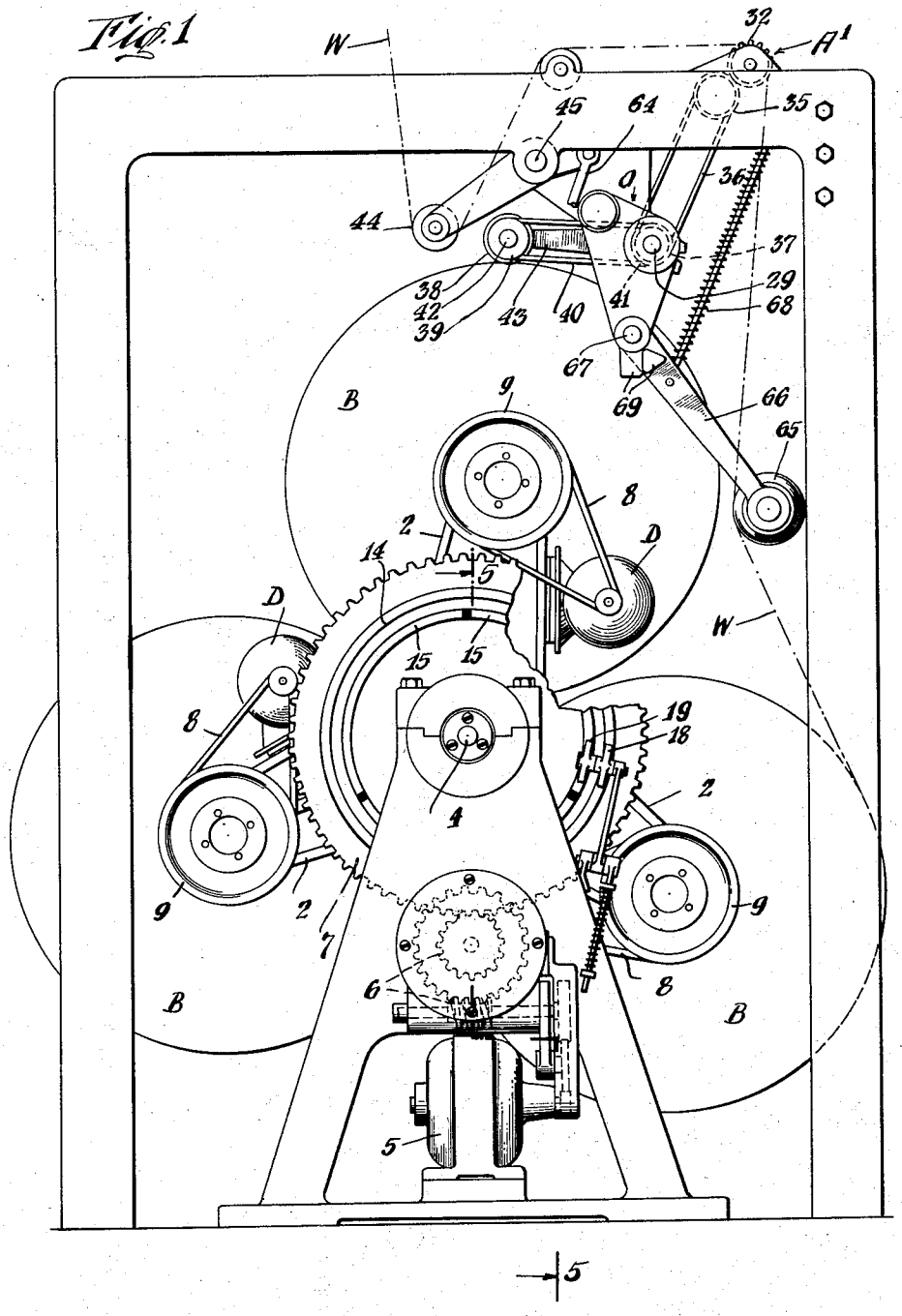
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WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 1

Fig. 1



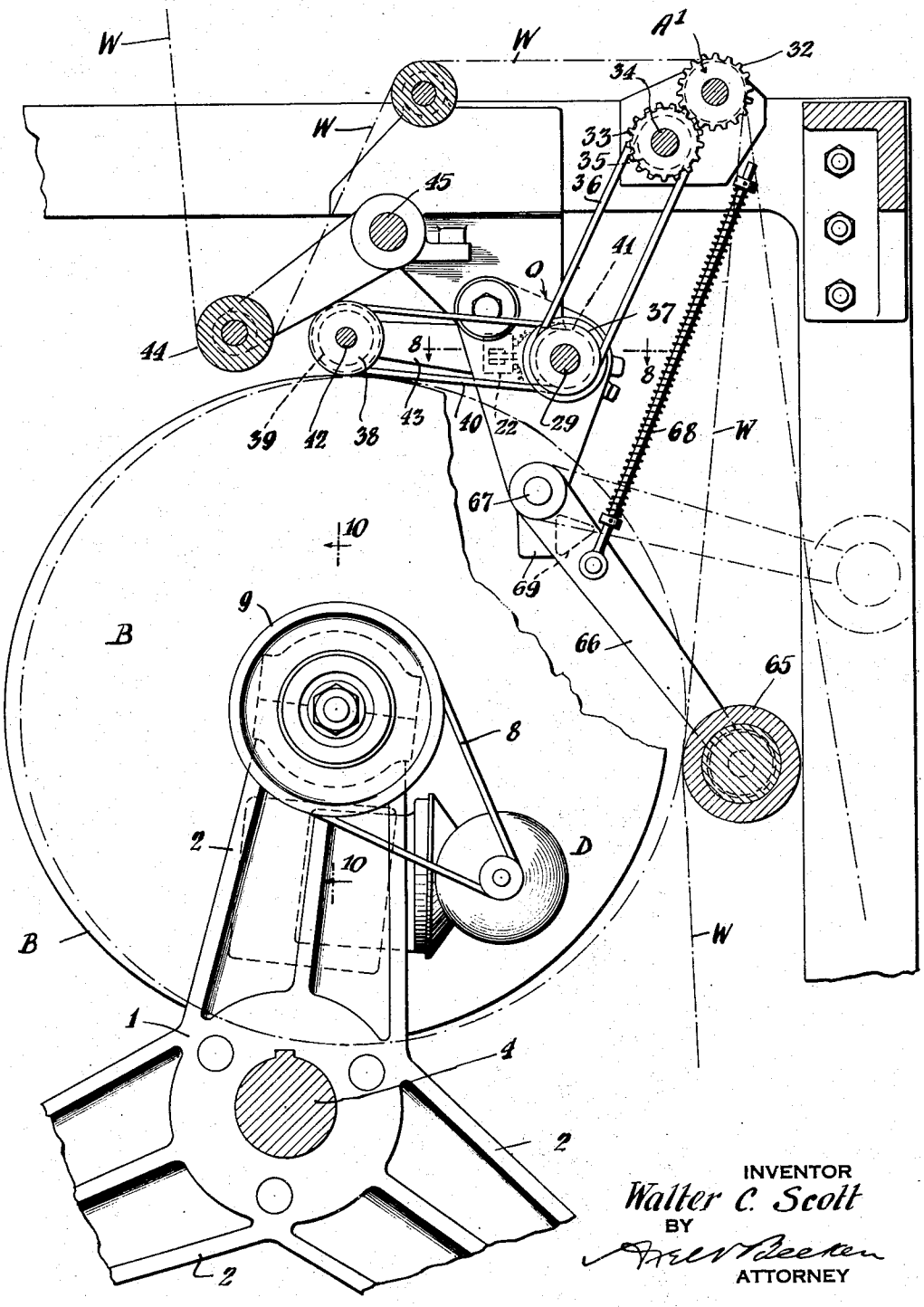
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WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 2

Fig. 2



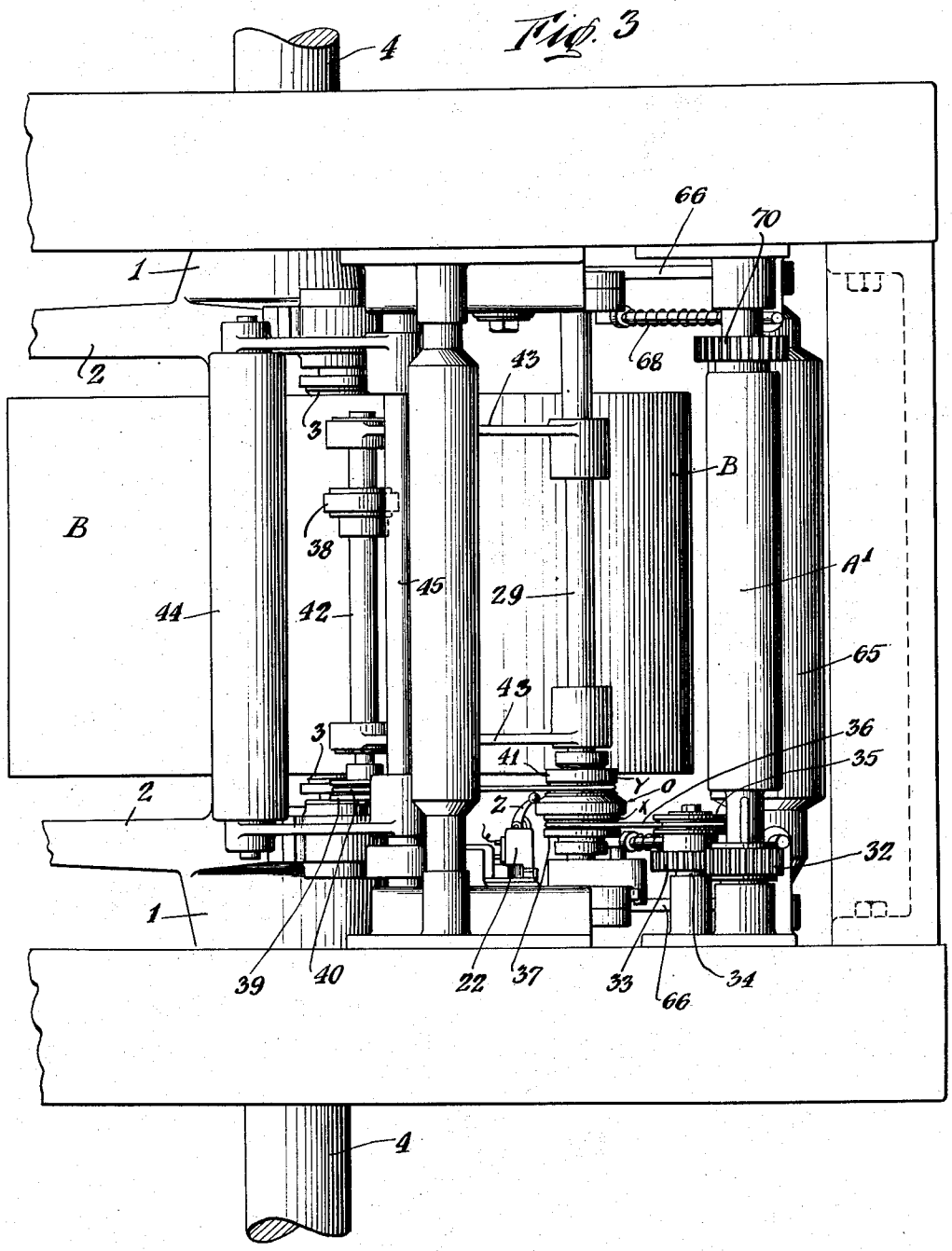
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WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 3

Fig. 3



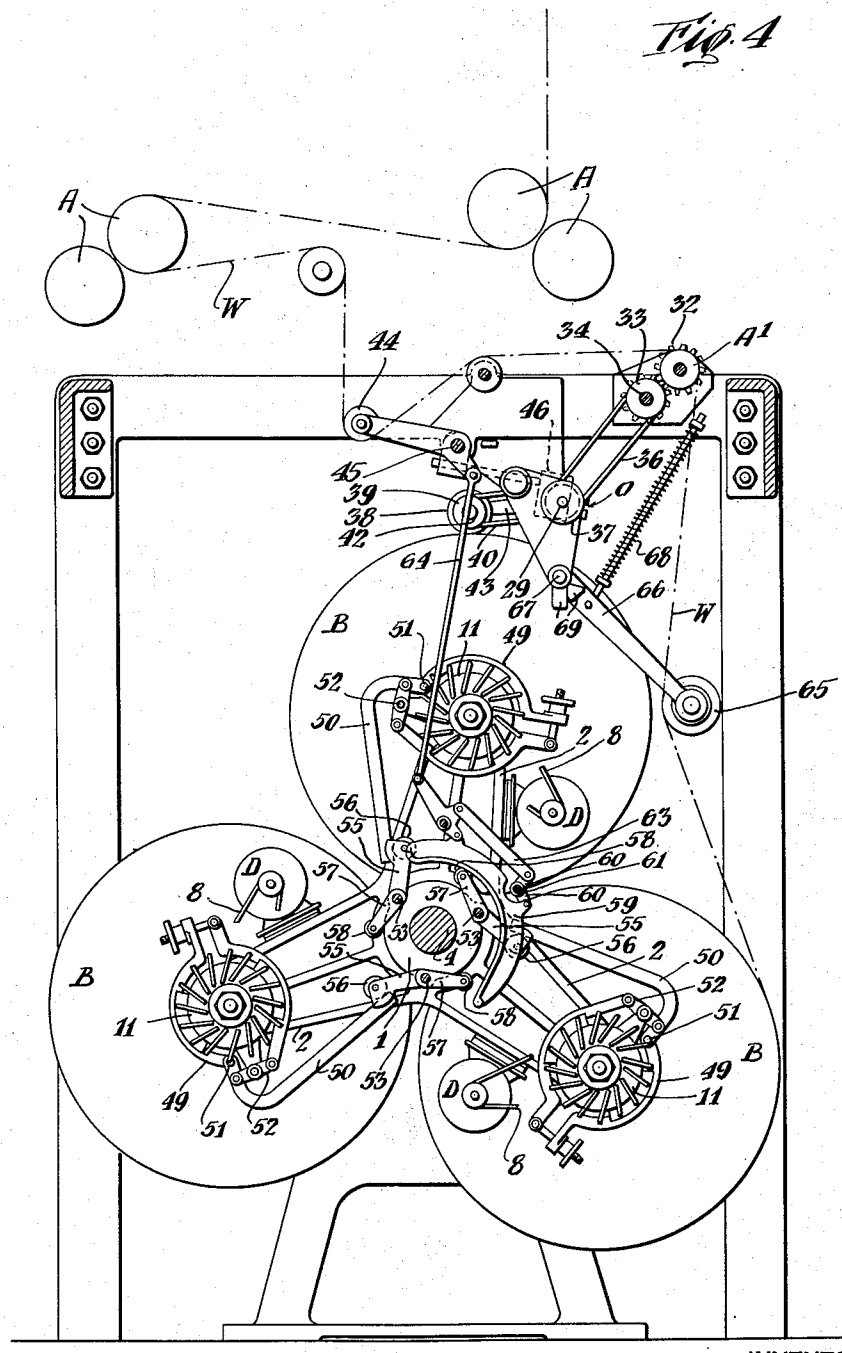
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WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 4

Fig. 4



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Filed June 11, 1936 7 Sheets-Sheet 5

Fig. 5

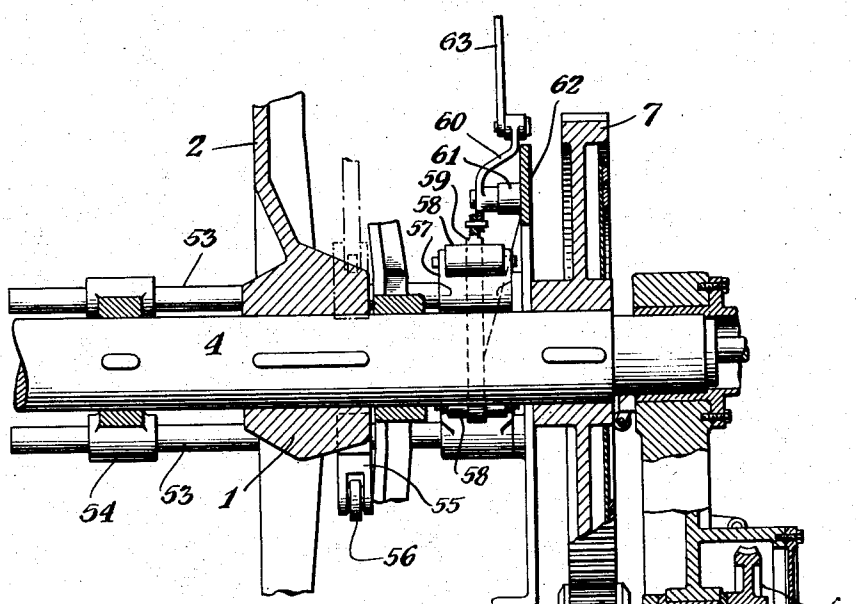
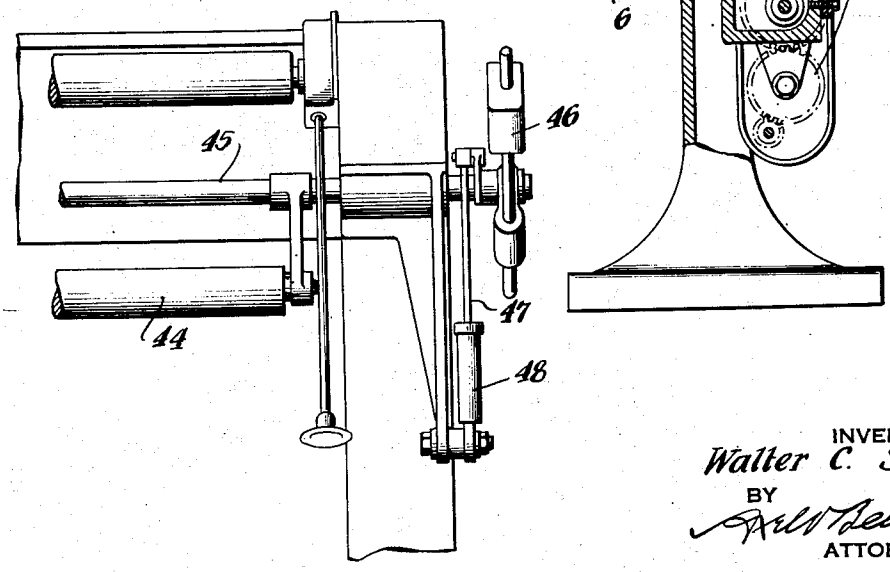


Fig. 6



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WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 6

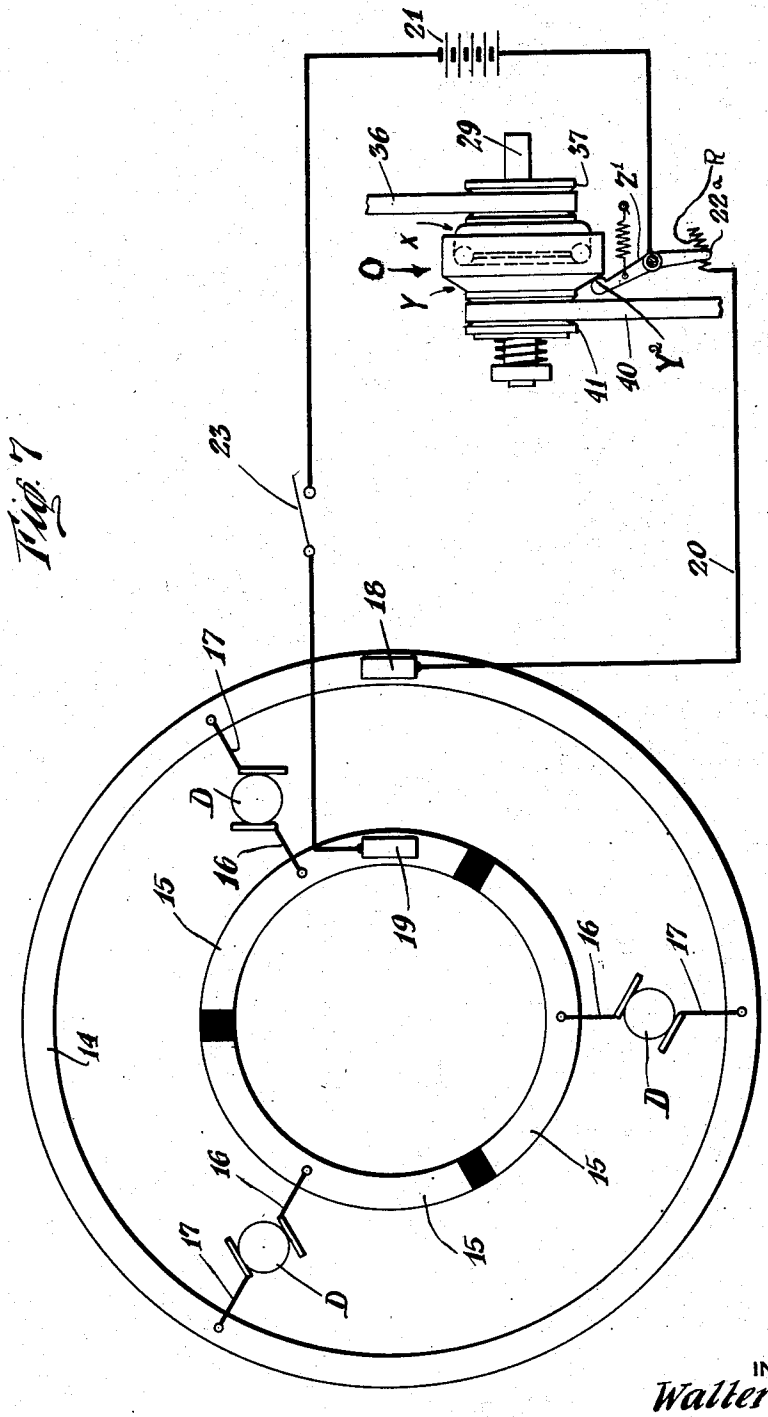


Fig. 7

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April 9, 1940. W. C. SCOTT 2,196,612

WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Filed June 11, 1936 7 Sheets-Sheet 7

Fig. 10

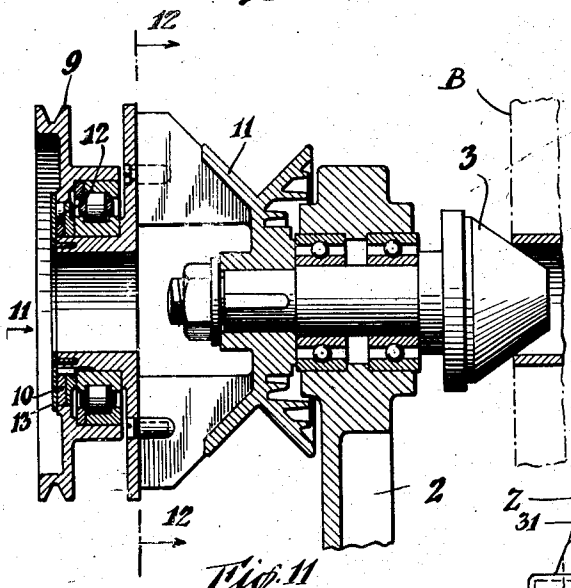


Fig. 8

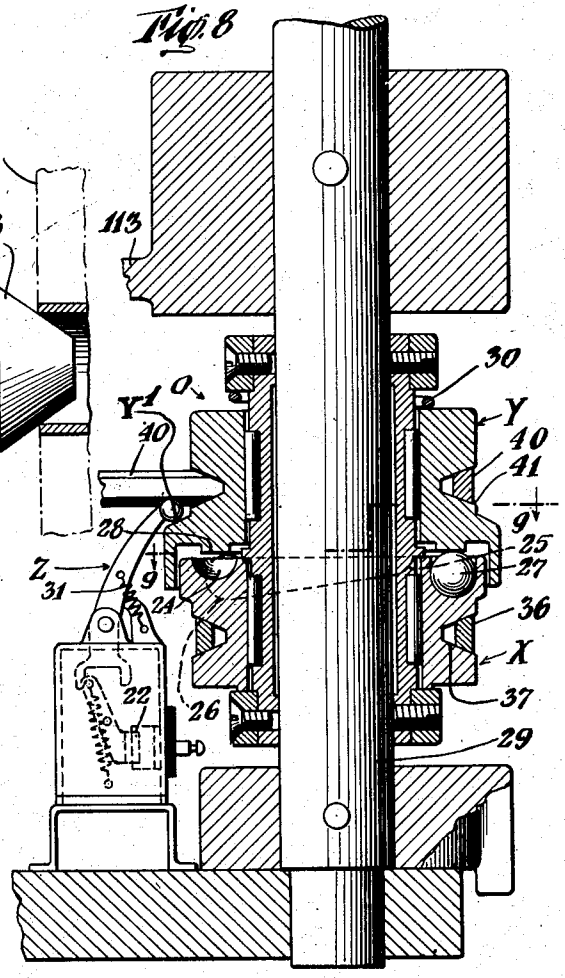


Fig. 11

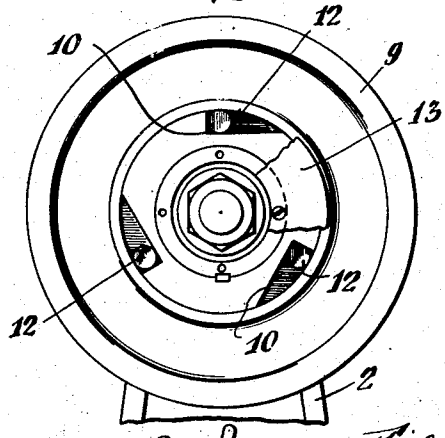


Fig. 9

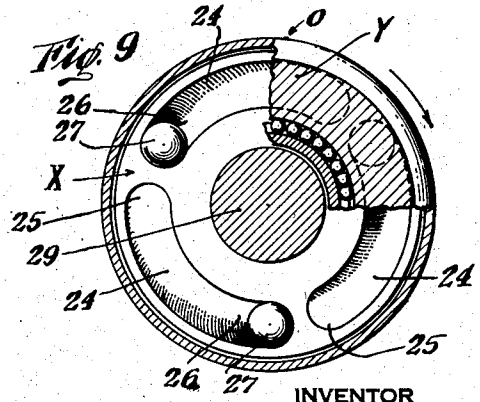
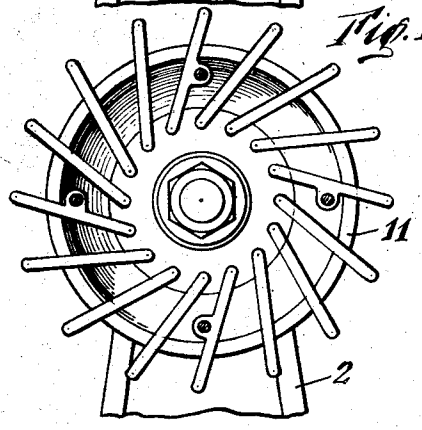


Fig. 12



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UNITED STATES PATENT OFFICE

2,196,612

WEB REPLENISHING MECHANISM AND CONTROL SYSTEM

Walter C. Scott, Plainfield, N. J.

Application June 11, 1936, Serial No. 84,679

4 Claims. (Cl. 242—58)

This invention relates particularly, although not for all purposes limited, to web replenishing mechanisms, such as are commonly referred to as flying pasters, in which a replenishing web roll is substituted in place of an active roll without stopping the printing or other web pulling machine that acts to unwind the web from the active roll.

The main object and feature of the invention is to provide simple and effective means to start rotation of the replenishing roll prior to the time that the webs of the two rolls are united, and to so coordinate the speed of the replenishing roll with that of the running web that the roll change can be effected at high speeds without undue shock to the webs.

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

The accompanying drawings illustrate the invention, and in said drawings:

Fig. 1 is a view in side elevation of a web supply mechanism embodying one form of the invention, but with the variable brake mechanism omitted for the sake of clearness;

Fig. 2 is an enlarged view, partly in section, of a portion of the mechanism shown in Fig. 1;

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

Fig. 4 is a view similar to Fig. 1 but on a sectional line just inside the side frames and disclosing the variable brake mechanism; the web pulling machine, here printing cylinders, are also indicated diagrammatically;

Fig. 5 is a vertical sectional view substantially on the plane of irregular line 5—5 of Fig. 1;

Fig. 6 is a fragmentary detail view of the tension control mechanism for the running web;

Fig. 7 is a diagrammatic view of the electrical equipment used in connection with the energization of the core driving motors of the web rolls;

Fig. 8 is a detail sectional view substantially on the plane of line 8—8 of Fig. 2;

Fig. 9 is a transverse sectional view substantially on the plane of irregular line 9—9 of Fig. 8;

Fig. 10 is a vertical sectional detail view substantially on the plane of line 10—10 of Fig. 2;

Fig. 11 is a detail view, partly broken away, looking in the direction of arrow 11 of Fig. 10; and

Fig. 12 is a vertical sectional view substantially on the plane of line 12—12 of Fig. 10.

In the exemplification of the invention herein disclosed, the construction is as follows: 1 indicates a rotatable reel or spider having three arms 2 at each of the opposite sides of the machine. Each of the pairs of opposite arms are provided with suitable means to support a web roll B, such means here taking the form of rotatable chucks 3 that engage the core of the web roll. As shown in Figs. 1 and 2, the lower right-hand roll is the active roll from which running web W is being unwound by web-pulling machine here indicated by printing cylinders A; the upper roll is the replenishing roll that eventually becomes the active roll, and the lower left-hand roll is a third roll that eventually becomes a replenishing roll and thereafter an active roll. Spider 1 is fast on shaft 4 mounted in suitable bearings, and this shaft is rotated at intervals by any convenient means such as by a handwheel or by a motor 5 to thereby bring the web rolls successively into operative position. Motor 5 transmits its motion to gear 7 on shaft 4 by transmission means 6 of any desired character. One of each pair of arms 2 carries a core-driving or boosting motor D connected by means of a flexible connection or belt 8 to a pulley or transmission member 9 that, when the motor is energized, drives chuck 3 through an overrunning clutch. The overrunning clutch consists here of a ratchet 10 and rollers 12, the ratchet being keyed to brake drum 11 carried by chuck 3, and said rollers 12 resting on the teeth of the ratchet and being engaged by the interior surface of transmission member 9. A plate 13 holds the rollers in position. The overrunning clutch is provided so that, when motor D is deenergized and the web is being unwound from the roll, the motion of the latter will not transmit motion to motor D.

The means for successively energizing motors D are here constructed as follows: mounted to rotate with reel 1, and here conveniently carried by gear 7, are two contact or collector rings, one, 14, being a continuous ring, and the other, 15, being in the form of three sectors insulated from each other. Each motor D has one lead 16 connected to a sector 15 different from that to which any other motor D is connected, and all of the motors are connected by leads 17 to ring 14. Mounted on the framework are two contact or brush members 18 and 19, that engage rings 14 and 15, which are included in a circuit 20 containing a source of power 21. Controlling this circuit is switch or circuit closer 22 (Fig. 8), or the movable element 22a of a rheostat R (Fig. 7), of speed control mechanism O. 23 is a hand operated switch. By these means it will be seen that only one of the three motors D, namely the one associated with the

web roll which at the time constitutes the replenishing roll, is energized at any time.

Speed control mechanism O may be of any suitable type but is preferably of the construction disclosed in my application Ser. No. 60,423, filed January 23, 1936 now Patent No. 2,119,247 of May 31, 1938, the detail arrangement here being as follows: X and Y indicate two control members, one, X, being driven proportional to the speed of roller A1, and the other, Y, being driven proportional to the speed of replenishing roll B. As explained in my said application Ser. No. 60,423, by "proportional" it is not intended that the control members must necessarily run at the same speed as the devices, here roller A1 and replenishing roll B, from which they derive their motion. Said control members may run faster or slower than said devices, although they may, of course, also run at the same speed as the devices. Control member X is provided with a series of arcuate grooves 24 that taper from one end 25 to the other 26, and in these grooves are located balls 27. Control member Y is provided with a continuous surface 28 that engages balls 27. The two control members are rotatably mounted on a shaft 29, and at least one of said members, here member Y, is capable of an axial movement on shaft 29 but is normally urged toward its companion by spring 30. Referring to Fig. 8, engaging control member Y at point Y1 is a control element Z that moves circuit closer 22 into open or closed position, the arrangement here being such that, when members X and Y are close together, circuit closer 22 is in its closed position, and, when member Y is moved axially away from member X, circuit closer 22 is in its open position, a suitable spring 31 or other means being employed to cause control element Z to follow the axial movement of member Y. In Fig. 7, the control member is indicated at Z1 and the point of contact of the latter with Y by the designation Y2. Control members X and Y are rotated independently of each other at all times and in the same direction and the gear ratio is such that, when the proper relative speed is established between the two devices A1 and B, said control members run at equal speed. So long as the speed of control member Y runs at a speed below or equal to that of control member X, balls 27 will remain in the deep end 26 of grooves 24 and spring 30 will be effective to move member Y toward member X. But so soon as the speed of Y exceeds that of X, balls 27 will advance toward shallow end 25 of grooves 24 and by their camming action against the tension of spring 30 will tend to separate members X and Y. It has been assumed here that the direction of rotation of members X and Y is as indicated by the arrow in Fig. 9 but it will be understood that the direction of rotation could be opposite to that indicated, in which event members X and Y would be separated so long as the speed of Y does not exceed that of X. In these circumstances, the action of switch 22 would be the opposite from that shown. The particular transmission means here employed to drive control members X and Y are as follows: Roller A1 carries a pinion 32 meshing with pinion 33 on shaft 34, and said shaft carries a belt pulley 35 from which motion is transmitted by belt 36 to pulley 37 on member X. 38 indicates a roller driven at the speed, in this instance the surface speed, of replenishing roll B. Roller 38 drives a pulley 39 connected by means of belt 40 to pulley 41 on member Y. Shaft 42 which carries roller 38 and pulley 39 is mounted on two arms 43 that are pivotally supported on a center coincidental with that of shaft 29 which carries control members X and Y, so that said roller 38 can be adjusted to contact, without disturbing the transmission mechanism from 38 to Y, the replenishing roll even if the latter is not of exact standard diameter. Also, it permits roller 38 and its associated elements to be moved up out of contact with the replenishing roll.

A suitable tension control mechanism for the running web is provided, which here takes the following form: 44 indicates a roller, carried by rockshaft 45, and around which running web W is threaded. This rockshaft 45 carries a balancing weight 46 and is connected to plunger 47 of dashpot 48 in accordance with the well-known Jones tension construction. Each supporting means 3 for a web roll B carries a brake drum 11 with which is associated a brake shoe 49, and each brake shoe is actuated by a brake lever 50 pivotally connected to one brake shoe member at 51 and pivotally connected to the other brake shoe member by a link 52. Although each web roll supporting means is equipped with a variable brake mechanism, it is desired to only control the brake mechanism of the active web roll. In order to accomplish this there are provided a plurality of rockshafts 53 supported on brackets 54 on shaft 4. On each rockshaft is an actuating lever 55 carrying a roller 56 to engage its corresponding brake lever. Also mounted on each of said rockshafts is an arm 57 carrying a roller 58. 59 indicates a cam to engage each roller 58 as the latter passes beneath the same, and said cam is pivotally carried by two levers 60 that are mounted on pins 61 supported on bracket 62 of the framework. Levers 60 are connected by link 63 and one of said levers is further pivotally connected to controller arm 64 which latter in turn is connected to controller roller 44 through rockshaft 45.

65 is a freely rotatable backing member supported by arms 66 pivoted at 67 on a bracket of the framework and urged into its lower position by spring 68. Suitable stops 69 are provided to limit the lowermost position of 65.

When a replenishing roll or web is to be united to an active roll or web, the replenishing roll is provided with paste in a well-understood manner and reel 1 is turned sufficiently to bring said replenishing roll into the full line position that it occupies in Figs. 1 and 2 in which position said replenishing roll is not in engagement with backing member 65. Web W from the active roll is running over backing member 65, roller A1, roller 44, and over various other rollers that need not be described, to the printing machine. Roller 38 is lowered into contact with the replenishing web roll, switch 23 is closed and, as the speed of member Y is at this time less than that of X, switch 22 is in its closed position. A circuit is therefore established through motor D of the replenishing roll thereby rotating the latter. Rotation of rollers A1 and 38 drive control members X and Y. Motor D continues to accelerate until the speed of the replenishing roll exceeds that of active web W whereupon the axial movement of member Y actuates control element Z and opens switch 22 thus cutting off power from motor D, allowing it to rotate due to its own momentum. It will be apparent that, if desired, switch 22 can be the movable element 22a of a rheostat R (Fig. 7) so as to merely

diminish the supply of power instead of cutting it off. When the speed of Y falls below that of X switch 22 is closed by its spring and motor D is again energized. This action continues until the active web roll has run down sufficiently and the speed of the replenishing roll and the speed of the active web W are substantially alike when the operator at the proper moment turns reel 1 sufficiently to bring the replenishing roll against the active web at the point where it engages backing member 65, thereby uniting the two webs in a well-understood manner. Active web W can now be severed at a point below backing member 65 and the web from the replenishing roll becomes the active web. Motor D has, of course, also been cut out either manually by switch 23 or by a limit switch. The operator now turns reel 1 again to bring the roll past backing member 65, which latter yields, and into the position of the active roll. In addition, rotation of reel 1 has transferred the control exercised by roller 44 of the tension control mechanism from the previously active web roll to the new active web roll, which transfer takes place at the moment of uniting the webs.

In order to understand one of the novel concepts and interrelations that underlies the various instrumentalities described in the foregoing, it must be borne in mind that it is desired to bring the speed of the replenishing web roll up to substantially that of the running web of the active web roll before the webs of the two rolls are united, to the end that the speed of the webs may be properly coordinated to thereby avoid undue shock to the webs in the act of uniting them.

As has been pointed out previously, speed control mechanism O controls the speed of the replenishing roll, and said speed control mechanism is in turn controlled by the speed relationship between the replenishing roll, which drives control member Y, and roller A1 which drives control member X. Roller A1 can be actuated in either of two ways: it can be actuated by running web W, or it can be driven from web-pulling or printing machine A. In either event the tension control mechanism will play an important role and performs a novel function in that the speed of the replenishing roll is responsive, before said roll is united to the running web, both to the speed and the tension of the running web, as will be understood from the following.

Let us first assume that roller A1 is actuated by the running web. In that event, if roller A1 is to accurately reflect the speed of the running web, it is necessary that the tension of the running web be maintained substantially uniform in order that said running web may have substantially uniform driving engagement with said roller, and this is accomplished by the action of roller 44 and the variable brake mechanism on the active roll.

Let us now assume that roller A1 is driven from the printing machine A by any suitable transmission means such as exemplified by gear 70 (Fig. 3). In that event, the speed of roller A1 would reflect accurately the speed of the printing machine but it might not for a variety of reasons reflect accurately the speed of the running web unless the tension of the running web is controlled; for instance the active web roll might be overrunning thereby releasing the running web faster than it could be taken up by the printing machine. Roller 44 and the variable brake mechanism therefore coordinate the speed of the running web with the speed of the printing machine and is therefore an element in the coordination of the speed of the running 15 web with that of the replenishing roll.

I claim:

1. In a web replenishing mechanism having an active roll, the web of which is threaded into a machine that unwinds the web from the roll, and a driven replenishing roll the web of which is to be united to the running web of the active roll; two independently rotating control members, mounted coaxially and at least one of which is movable lengthwise of its axis toward and away from the other, said members rotating in the same direction, one driven at a speed proportional to the speed of the running web, and the other driven at a speed proportional to the speed of the replenishing roll; and means responsive to a variation in speed between the two control members to vary the speed of the replenishing roll.

2. In a web replenishing mechanism having an active roll, the web of which is threaded into a machine that unwinds the web from the roll, and a driven replenishing roll the web of which is to be united to the running web of the active roll; two independently rotating control members, mounted coaxially and at least one of which is movable lengthwise of its axis toward and away from the other, said members rotating in the same direction, one driven at a speed proportional to the speed of the running web, and the other driven at a speed proportional to the surface speed of the replenishing roll; and means responsive to a variation in speed between the two control members to vary the speed of the replenishing roll.

3. In a web replenishing mechanism having an active roll, the web of which is threaded into a machine that unwinds the web from the roll, and a replenishing roll, the web of which is to be united to the running web of the active roll; actuating means, other than the running web, to drive the replenishing roll; two independently rotating control members, mounted coaxially and at least one of which is movable lengthwise of its axis toward and away from the other, said members rotating in the same direction, one driven at a speed proportional to the speed of the running web, and the other driven at a speed proportional to the speed of the replenishing roll; and means responsive to a variation in speed between the two control members to vary the speed of the actuating means for the replenishing roll.

4. The method of controlling the replenishing roll of a web replenishing mechanism having an active roll the web of which is threaded into a machine that unwinds the web from the roll, and a driven replenishing roll the web of which is to be united to the running web of the active roll, which consists in: accelerating the speed of the replenishing roll above the desired uniting speed and then allowing said replenishing roll to continue rotation due solely to its own momentum at a gradually decelerating speed before uniting the webs of the two rolls.

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