

March 21, 1933.

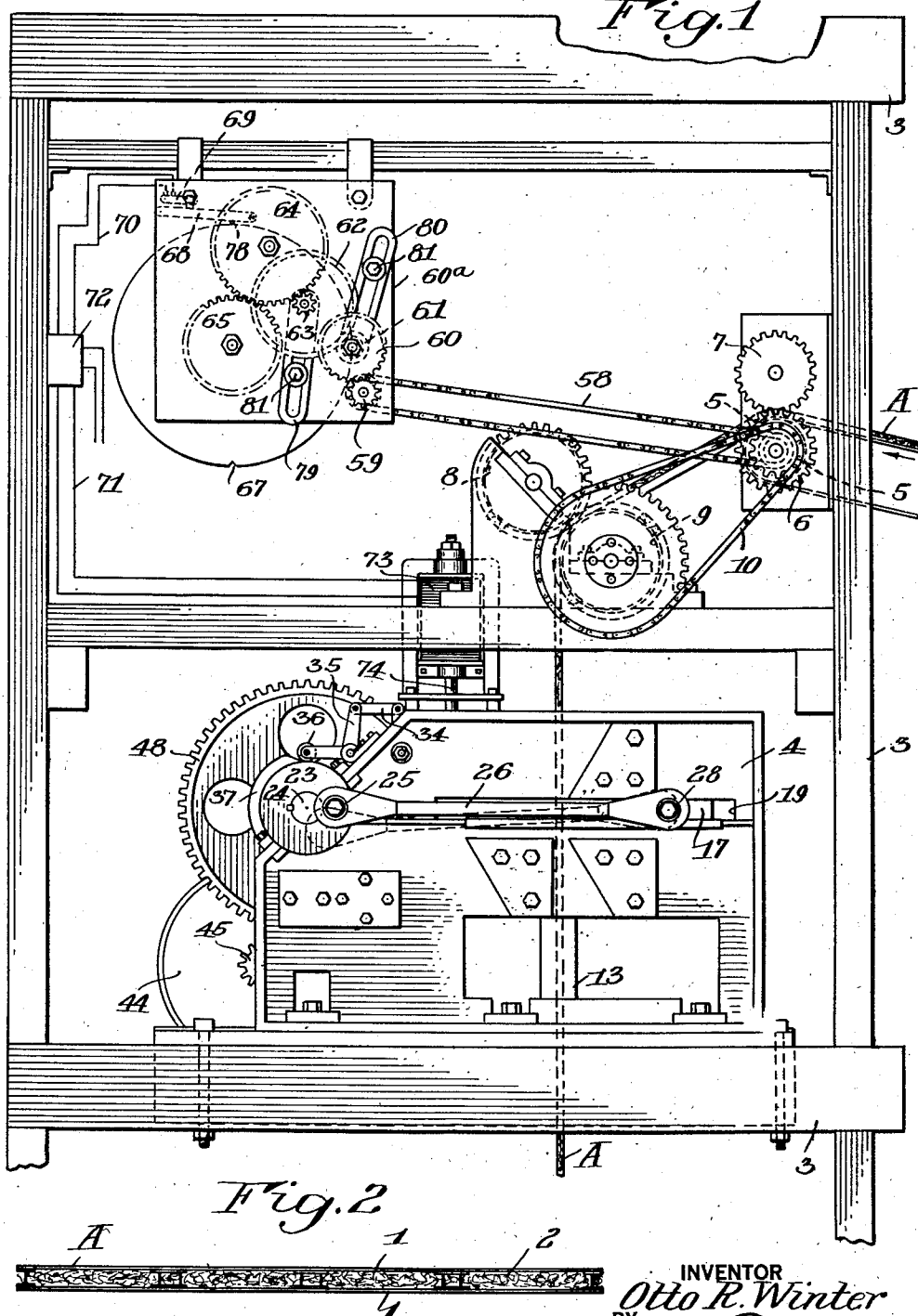
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1,902,604

SHEET SEVERING MECHANISM

Filed Jan. 22, 1930

6 Sheets-Sheet 1



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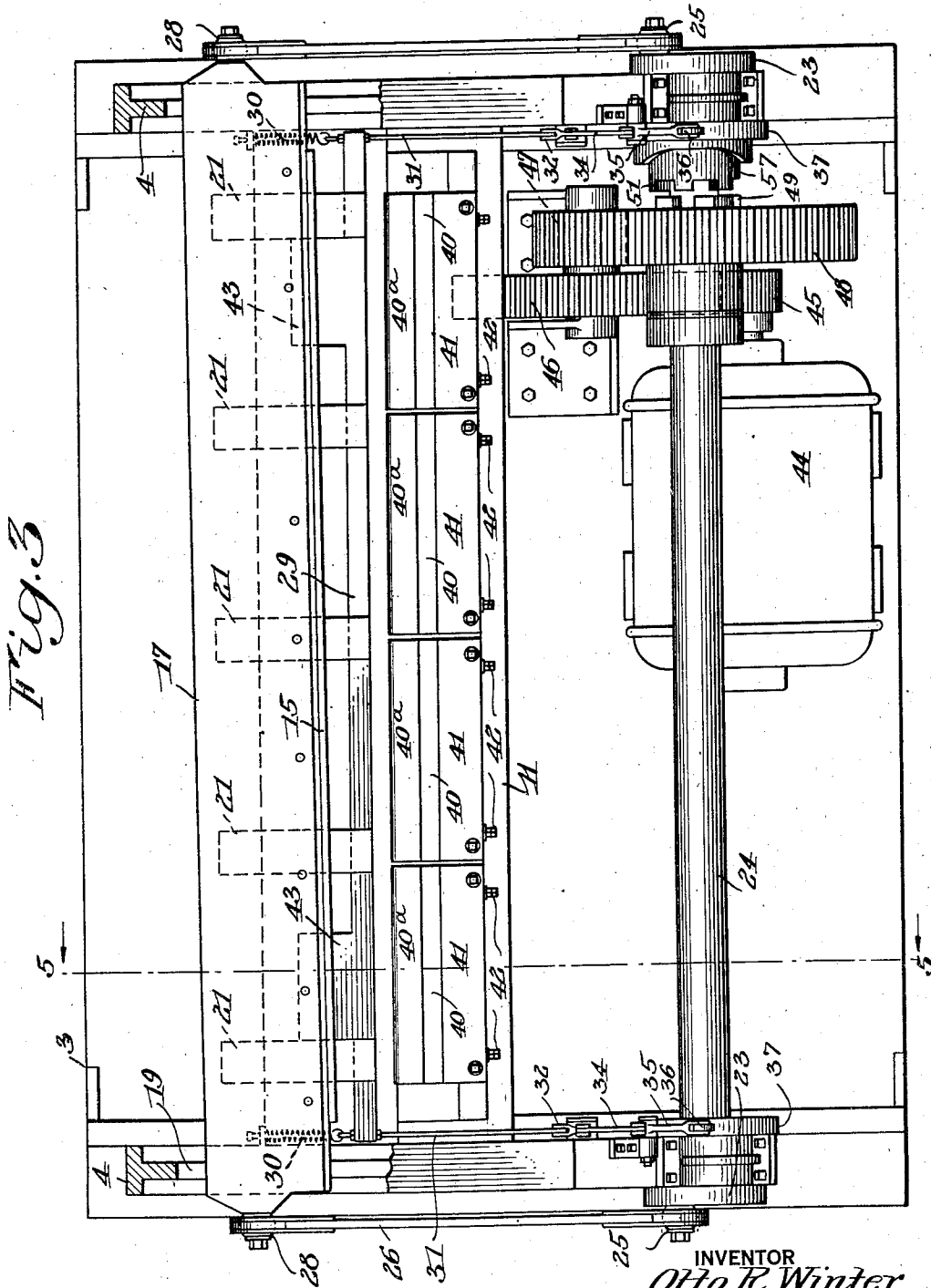
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SHEET SEVERING MECHANISM

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6 Sheets-Sheet 2



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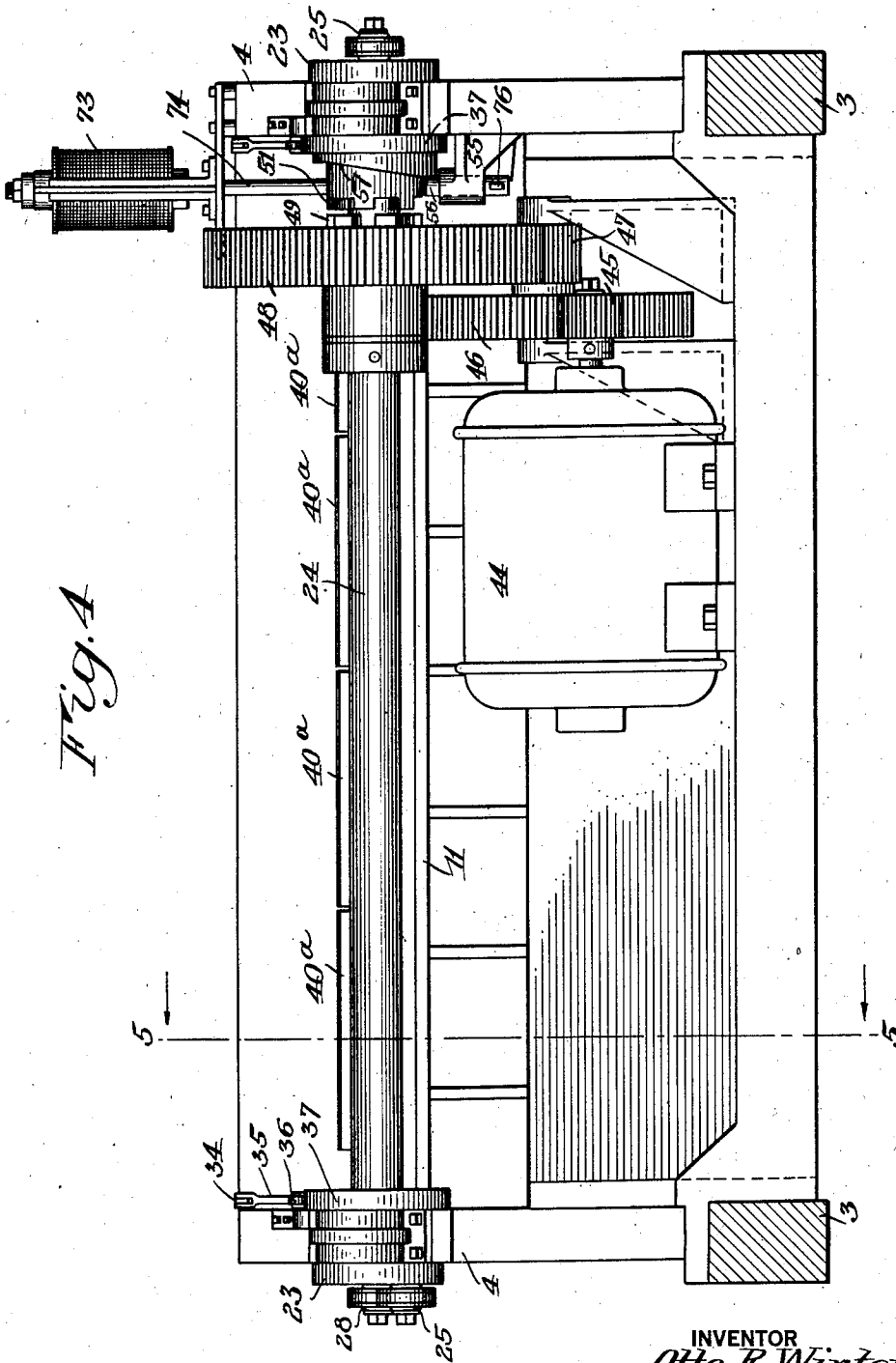
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SHEET SEVERING MECHANISM

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6 Sheets-Sheet 3



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SHEET SEVERING MECHANISM

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6 Sheets-Sheet 4

Fig. 5

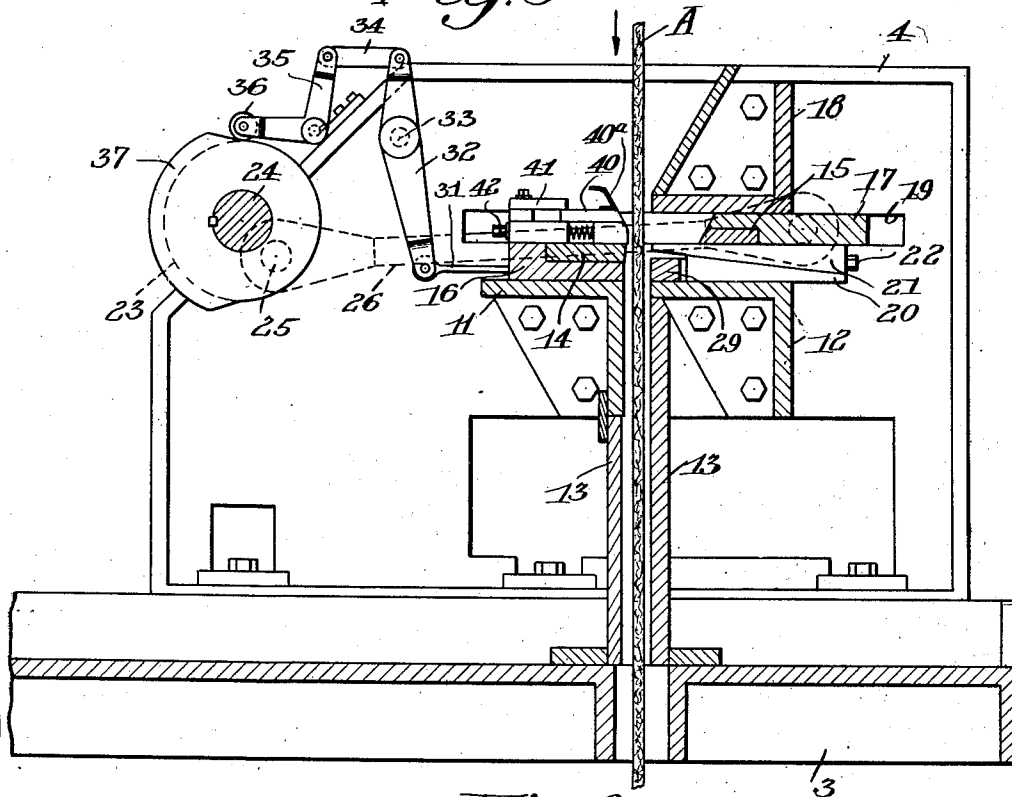
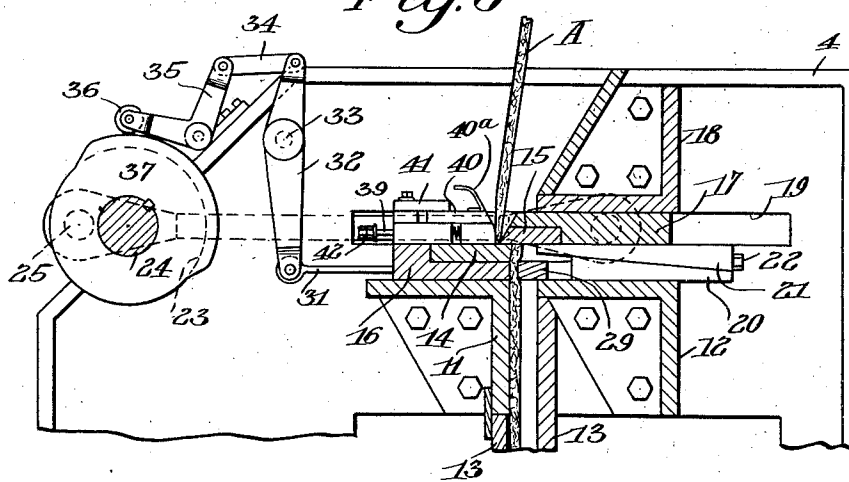


Fig. 6



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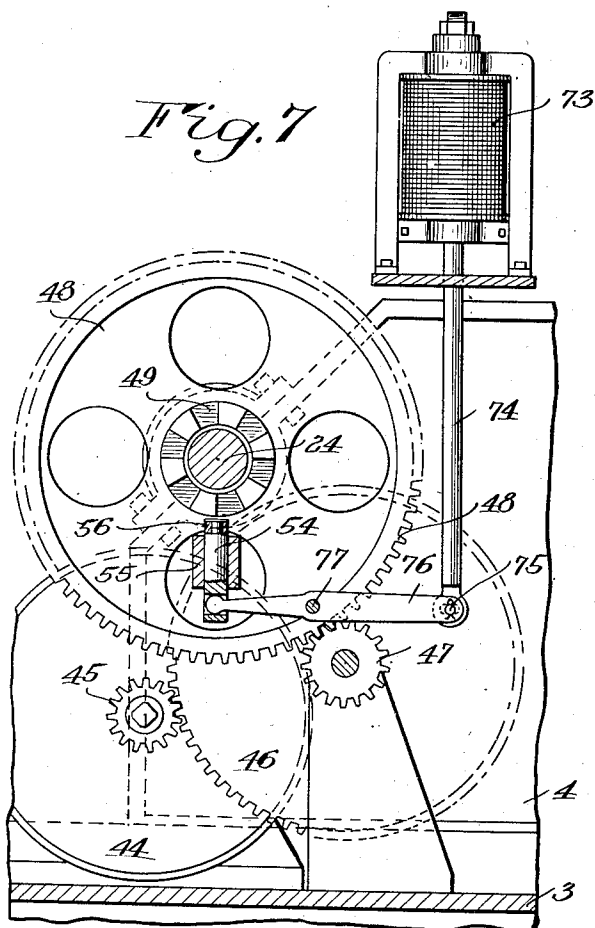
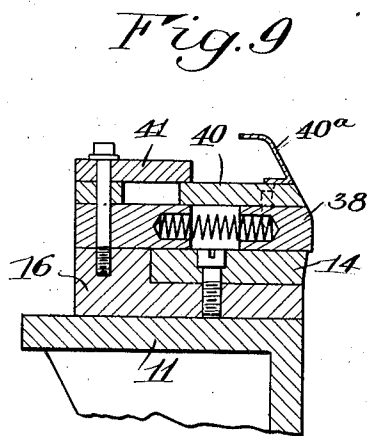
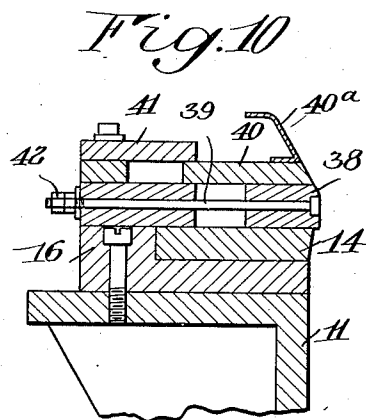
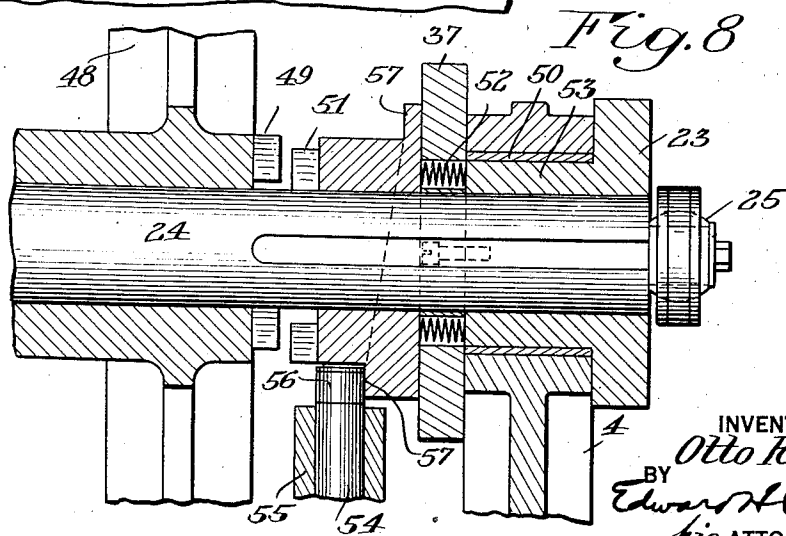
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SHEET SEVERING MECHANISM

Filed Jan. 22, 1930

6 Sheets-Sheet 5



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SHEET SEVERING MECHANISM

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Fig. 11

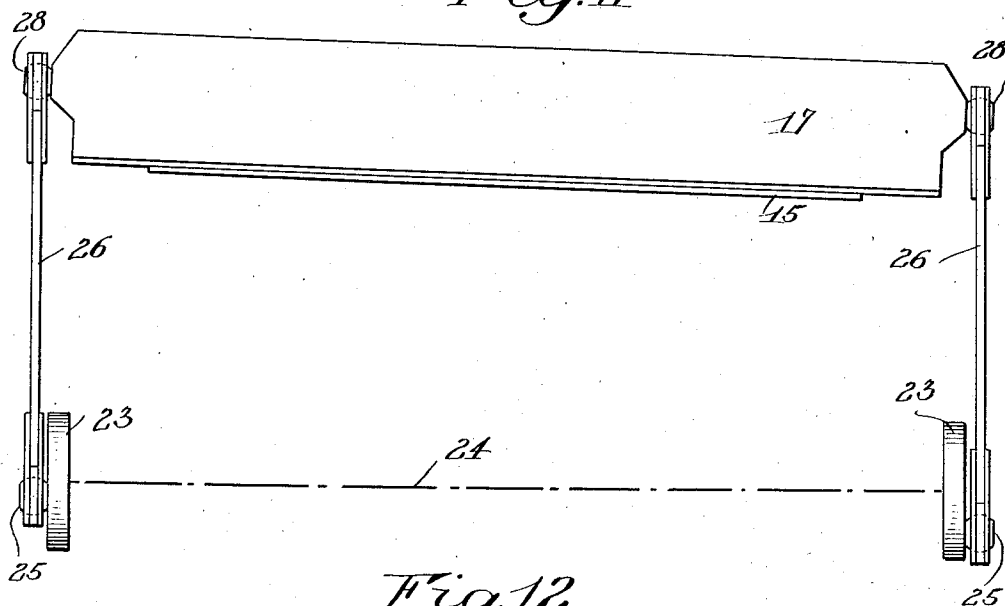


Fig. 12

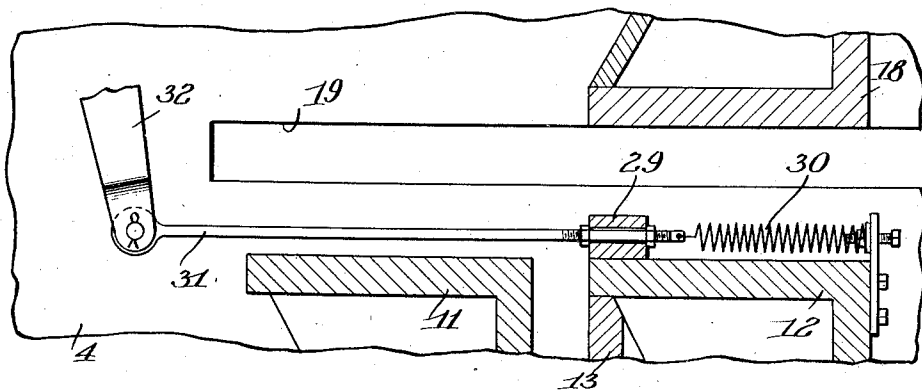


Fig. 13

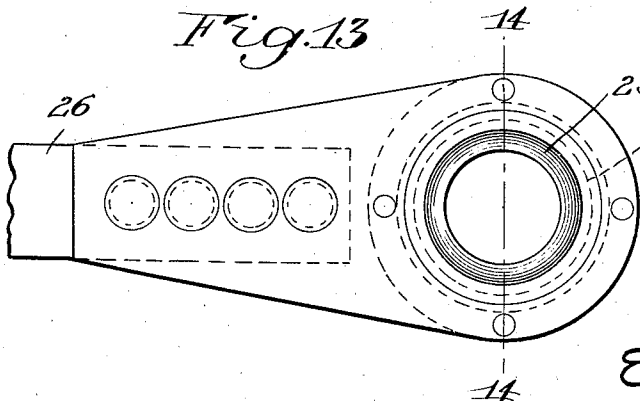
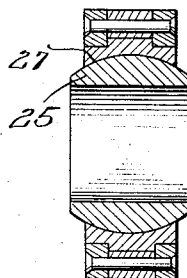


Fig. 14



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UNITED STATES PATENT OFFICE

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SHEET SEVERING MECHANISM

Application filed January 22, 1930. Serial No. 422,686.

My present invention relates to cutting or severing mechanism and particularly to machines of this character best adapted to the cutting of continuous moving strips of sheet material. It has for its object to provide a simple, efficient and durable mechanism that will act continuously and automatically. The improvements are directed in part to providing means whereby the sheet or strip is automatically severed at intervals into uniform lengths; to improving and rendering more effective the actuating movements for the knives; to adjusting means for the knives and to timing mechanism whereby the feeding and severing elements are synchronized.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a side elevation of a sheet severing mechanism constructed in accordance with and illustrating one embodiment of my invention;

Fig. 2 is a section of a sheet-like product consisting of a felted bat for operation upon which the particular machine illustrated has been designed to operate;

Fig. 3 is a top plan view of the knife units and their operating mechanism taken in section, horizontally, through the frame of the machine;

Fig. 4 is an end view of the same;

Fig. 5 is a vertical section taken substantially on the line 5—5 of Figs. 3 and 4;

Fig. 6 is a similar but more fragmentary section showing the parts in the positions assumed after the cutting stroke;

Fig. 7 is an enlarged section of the clutch operating mechanism;

Fig. 8 is an enlarged section taken centrally through the knife operating clutch and the driven shaft thereof;

Fig. 9 is an enlarged detailed fragmentary section through the fixed knife and the ejector associated therewith;

Fig. 10 is another similar section of the

same parts taken transversely at another point along the length of the cutter;

Fig. 11 is a plan view of the movable knife and its actuating connections alone;

Fig. 12 is an enlarged fragmentary section showing the mechanism of the clamping bar that holds the sheet during the cutting movement;

Fig. 13 is an enlarged fragmentary side view of the bearing of one of the knife actuating pitmen, and

Fig. 14 is a section on the line 14—14 of Fig. 13.

Similar reference numerals throughout the several views indicate the same parts.

As before intimated the particular machine that I have illustrated in the accompanying drawings has been designed to cut into uniform lengths from a continuously forming and moving strip of felt-like material, such as shown in Fig. 2. This material consists of a bat usually running in thicknesses from a quarter inch to an inch or more and it is formed in the present instance of two outer paper liners 1 confining between them a core or center 2 of a flocculent or felted nature consisting of fibers or mixtures of fibers, such as cotton, cotton lint, jute, wood fibers, animal hair, grasses, etc. It is used primarily for insulating the walls of buildings but may be used for carpet lining and other purposes.

Such material is rather heavy, in fact very heavy in large sheets, and in the practice of my invention, I therefore prefer, as shown, to feed, measure and cut it while it is in a hanging or depending position in a vertical plane. It is also well known in the cutting art that such thick but yielding material is difficult to sever rapidly and cleanly—in most instances, more difficult than a relatively hard but firm material. These facts should be borne in mind in order to completely understand my invention and the utility thereof.

Referring first to Figs. 1 and 5, 3 indicates generally the main frame of the machine and 4 side plates bolted thereto that individually support the cutting unit per se. The bat, indicated generally at A, will be presumed for

the purposes of this description to be issuing in the direction of the arrow from the bat making machine. It first passes over a feed roller 5 having a gear 6 thereon driven from the main driving gear 7 and then through creasing rolls 8 and 9, as part of a swatching operation that has nothing to do with the present invention, except that in the present instance the bat hangs vertically by its own weight from these rolls, which therefore define the plane in which it is operated upon by the cutters. The swatching rolls are geared together as shown and operated by the sprocket chain 10 from the feed roll shaft 5.

Transverse bridge pieces 11 and 12 extend between the side frame 4 and the bat A moving downwardly passes between them and through a throat or guide 13 formed by vertical plates associated therewith and supported on the main frame 3. These bridge pieces support the cutters or knives which comprise, in the present instance, a fixed knife 14 on bridge piece 11 and a movable knife 15 on bridge piece 12. The fixed knife 14 is held in a mounting bar 16. The movable knife is mounted in a similar mounting bar 17 and is confined between lower bridge piece 12 and a similar upper bridge piece 18, while its ends are further slidable in slotted guides 19 in the side frames 4. Interposed between the lower bridge piece 12 and the movable knife and its mounting bar 17 at intervals (see also Fig. 3) are a plurality of wedge locks consisting of lower fixed elements 20 and upper elements 21 that may be adjusted with reference thereto by an adjusting bolt 22 in each instance to raise or lower the path of movement of the cutting edge of that knife with reference to the cutting edge of the fixed knife 14 at various points. This provision is particularly necessary because the knives are very long and the movable knife 16 is apt to sag. There is, of course, a running fit between the knife bar 17 and the upper bridge piece 18.

Turning now to Figs. 11, 13 and 14, I will next describe at this point a particular novel means for actuating the movable knife 15 and its mounting bar 17 in a peculiar manner to overcome the yielding resistance of the particular article or work piece described (though effective in all instances) and obtain a perfect shearing cut. Disks 23 on a driven shaft 24 to be later described (see also Fig. 8) are provided with spherical wrist pins 25 to which are connected pitmen or connecting rods 26 provided with spherical bearings 27 to receive them. There is exactly similar connection indicated at 28 between the other ends of the connecting rod and the ends of the movable knife mounting 17. The wrist pins 25 are not, however, on the same axes but are offset circumferentially of the disks 23, so that although a

complete revolution of the latter eventually carries the moving knife 15 into cutting cooperation with the fixed knife 14 from the position in Fig. 5 to that of Fig. 6, the blade 15 rocks in the plane of cutting movement from end to end during its passage through the bat or sheet material and shears it effectively with a progressively shearing cut, as will be understood.

Associated with the cutter, I provide means for clamping the bat in the vicinity of the cutting point during the cutting movement. This clamp is best shown in Figs. 3, 5, 6, and 12. It consists in the present instance of a transverse bar 29 slidable on the bridge piece 12 from the position of Fig. 5 to that of Fig. 6, in which it holds the severed section of bat tightly against the stationary knife 14 or its mounting 16. The clamping bar returns to initial position when the cut is finished and allows the severed sheet section to drop into the swatcher, also permitting the oncoming strip to proceed between the knives and into its guide. As shown in Fig. 12, it is thus retracted in the present instance by a spring 30. It is positively actuated into clamping position by a pair of draw bars 31 each connected at one end to one end of the clamping bar and at the other to one end of a lever 32 (Figs. 5 and 6) pivoted at 33, the other end of which is connected pivotally by a link 34 with a bell crank 35 having a follower roller 36 riding on a cam 37 on shaft 24. As this same shaft drives the cutters, as hereinafter described, it will be clear that the necessary timed relationship is established between this clamping bar and the movable knife.

As there is no force tending to displace the clamping bar 29 upwardly, this bar may rest by gravity upon the bridge piece 12 without any upper guide to hold it down. Extensions 43 (Fig. 3) are provided on the clamping bar to contact with the sides of certain of the wedges 20 and 21 to prevent cocking of the clamping bar and to hold it against longitudinal displacement.

It will be seen from a comparative inspection of Figs. 5 and 6 that after the loosely hanging bat A is clamped and sheared, the movable knife carries the unsevered portion thereof over so that its edge rests upon the fixed knife. Remembering that this unsevered portion is constantly advancing, with the parts so far described, the feeding pressure would tend to cause this edge to remain upon the fixed knife and not find its guide opening between the knives. In consequence, it would buckle materially. To prevent this I provide an ejector shown generally in Figs. 5 and 6 and more in detail in Figs. 9 and 10. It consists in the present instance of a transverse bar 38 slidable upon the fixed knife 14 to recede before the cutting movement of the movable knife and to

advance to or beyond the cutting edge of the fixed knife when the movable knife returns from its cutting stroke to the position of Fig. 5. In the present instance, it is operatively spring actuated and is displaced by the contact of the movable knife 15, as shown in Fig. 6. It has the effect of realigning the bat A with respect to the knives and its guide 13, so that it may again gravitate freely therethrough, while at the same time it performs the function of cleaning and keeping clear the cutting edge of the fixed knife upon which the fine fibers have a tendency to adhere.

The ejector 38 is guided by bolts fixed therein and indicated at 39 (Fig. 10) and sliding through a portion of the mounting bar 16 and also by extension plates 40 slidable under gibs 41 on the said bar. Adjusting nuts 42 on the bolts or rods 39 control the limit of operative movement of the ejector bar 38. The forward edges of the plates 40 are inclined obliquely, as shown, and oblique sheet metal extensions 40a may be mounted on the plates 40, as illustrated in Figs. 9 and 10, to assist in guiding the end of the bat into proper position in case it becomes displaced.

Having described the several actuators for the knives, the clamping means and the ejector, I will now describe their operating connections whereby the proper timed relationship between them in their movement is effected. Referring more particularly to Figs. 1, 4, and 7, this general unit or group of units on the frame 4 is driven by an individual motor or similar source of power 44, having a driving pinion 45 which, through gears and pinions 46, 47, and 48, continuously turns a clutch element 49 on gear 48 turning freely on shaft 24 (Fig. 8) which has bearings 50 in the frame pieces 4. Feathered on the shaft 24 opposite the clutch element 49 is a complementary clutch element 51 which is thus non-rotatably connected to the shaft 24 but is free to slide longitudinally thereon into and out of cooperation with clutch element 49.

The above mentioned disks 23 carrying the wrist pins 25 for the knife actuators are fixed to the shaft 24, as are the cams 37 for actuating the clamping bar 29. Cavities in one cam 37 house springs 52 which react against the end of a bearing sleeve 53 on disk 23 and tend to throw the movable clutch element 51 into engagement with element 49. This is normally prevented and the clutch is held out by a push pin 54 reciprocable in an extension 55 of the frame and having at its upper end a roller 56 that rides on a cam surface 57 on the movable clutch element 51, the high and low points of this cam surface being shown in full line in Fig. 8 and the intermediate portion in dotted lines. For reasons hereinafter ex-

plained, the push pin 54 is intermittently withdrawn from the position shown in Fig. 8 allowing the clutch to go in. It instantly returns, however, and the shaft 24 makes one revolution while the low point of the cam 57 is passing the pin. As soon as the high point of the cam reaches the pin, however, the movable clutch element is retracted and the position of Fig. 8 again assumed. In the meantime, the knives or cutters and their accessories are actuated as hereinbefore described.

I now come to an explanation of how this intermittent operation of the cutting group on frame 4 under its own power is synchronized with the feeding of the bat to give the desired length to the severed sheet. As before described, the main driving gear 7 of the feeding mechanism turns the feed roll 5 upon which latter is a sprocket connected by a sprocket chain 58 with a sprocket fixed to a gear 59 in a gear box 60a. The chain of gearing (which is a reducing gear) runs from gear 59 to 60 to 61 to 62 to 63 to 64 to 65. The latter gear is fixed to a disk 66 having a notch 67 therein. Riding on the perimeter of the disk is the lever 68 of a familiar form of mercury switch 69, normally open. Its circuit 70 controls a stronger circuit 71 through a switch therein contained in a relay box 72, all of which is familiar in starting mechanism for electric driving circuits. Circuit 71 includes the field of a solenoid 73 mounted on the frame piece 4. Its core 74 is pivotally attached at 75 to a lever 76 pivoted at 77. The other arm of this lever takes into the lower end of the push pin 54. It will thus be seen that when the solenoid is energized, the core will lift up on the lever 76 and retract the push pin. The actuation of the clutch 51 as before described will result.

The length of strip A that is fed before the knives operate and hence the length of the severed sheet is determined and controlled by the rate at which the disk 66 of the timing gear revolves and there is one cut to each revolution thereof. The lever 68 in the gear box has a contact point 78 that rides on the disk but when, once in each revolution, this drops into the notch 67, the switch 69 is momentarily closed, the circuit 71 is thereby momentarily closed and the solenoid 73 momentarily energized. This is sufficient, however, to withdraw the push pin 54 from the high point of the cam face 57 throwing in clutch 51 and thereafter said clutch is withdrawn by the immediate return of the push pin in the manner explained in connection with the description of the latter.

To change the speed of the disk 66 and hence the length of the cut, larger or smaller pinions are substituted at 61 and 63 on the well known principle, these pinions for such

reason being mounted on brackets 79 and 80 held adjustable on clamping bolts 81.

I claim as my invention:

1. In a sheet severing mechanism, the combination with a fixed knife and a movable knife cooperating therewith, of guides for the latter including a supporting surface having a plurality of adjusting means at intervals along the length of the knife to regulate its cooperation with the fixed knife.
2. In a sheet severing mechanism, the combination with a fixed knife and a movable knife cooperating therewith, of guides for the latter including a supporting surface having a plurality of adjusting means at intervals along the length of the knife to regulate its cooperation with the fixed knife, said means comprising wedge blocks and means for operating the same.
3. In a sheet severing mechanism, the combination with a fixed knife, a movable knife cooperating therewith, and guides for the latter, of an ejector for the sheet associated with the fixed knife and adapted to recede before the cutting edge of the movable knife during the cutting stroke, said ejector operating to restore the sheet to the plane it occupied before the cutting stroke, and a clamp arranged to clamp the sheet before the movable knife coacts with the fixed knife.
4. In a sheet severing mechanism, the combination with means for feeding a sheet downwardly in a vertical plane, of a fixed knife and a movable knife cooperating in a horizontal plane for the cutting operation, means for guiding the sheet between the knives, an actuating means for the movable knife causing it to rock from end to end, reversely, in the plane of cutting movement as it approaches the fixed knife, so that opposite ends of said movable knife move out of phase with each other, and means for clamping the sheet in the guide to the fixed knife before the movable knife cooperates therewith.
5. In a sheet severing mechanism, the combination with means for feeding a sheet downwardly in a vertical plane, of a fixed knife and a movable knife cooperating in a horizontal plane for the cutting operation, means for guiding the sheet between the knives, an actuating means for the movable knife causing it to rock from end to end, reversely, in the plane of cutting movement as it approaches the fixed knife, and means for clamping the sheet in the guide to the fixed knife before the movable knife cooperates therewith, and a reciprocatory ejector adapted to restore the end of the depending sheet from which a length has been cut into alinement with its guide and also adapted to recede from such position as the movable knife returns on the next cut.
6. In a sheet severing mechanism, the

combination with a feed roll over which a sheet of batting may be fed in a depending vertical plane, of a pair of horizontally arranged knives between which the bat passes, driving means for the feed roll and knives and reducing gear means through which the knives are controlled by the feed roll, said reducing gear being provided with an intermittent single cycle timing mechanism operating to cut the bat in definite uniform lengths embodying a driven shaft, actuators for the movable knife operated thereby, a clutch between said shaft and the actuators, a solenoid controlling the clutch, and means for intermittently energizing the solenoid.

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