May 22, 1951 C. J. ROHLAND 2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Filed Aug. 28, 1946 5 Sheets-Sheet 1

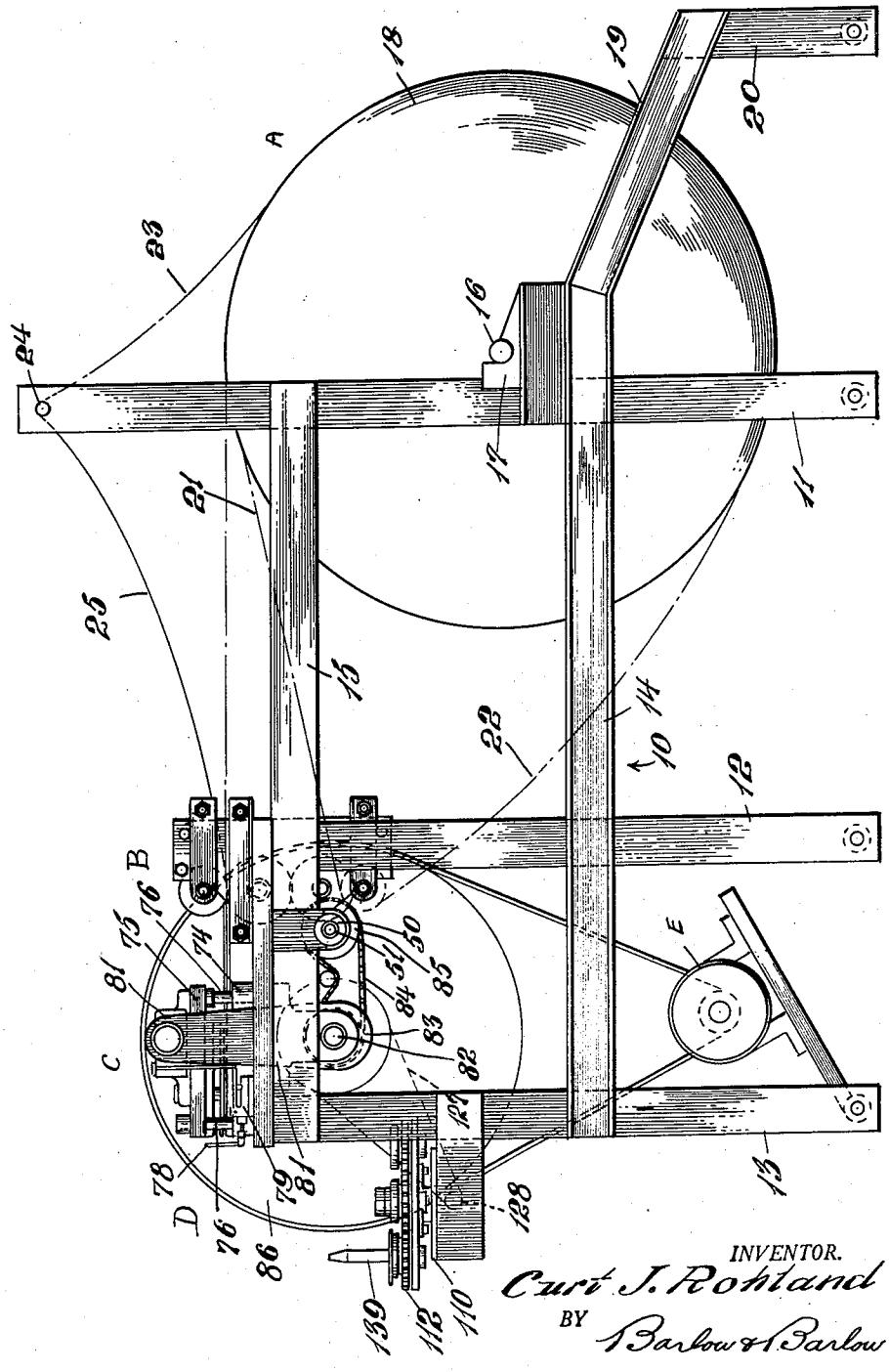


Fig. 1.

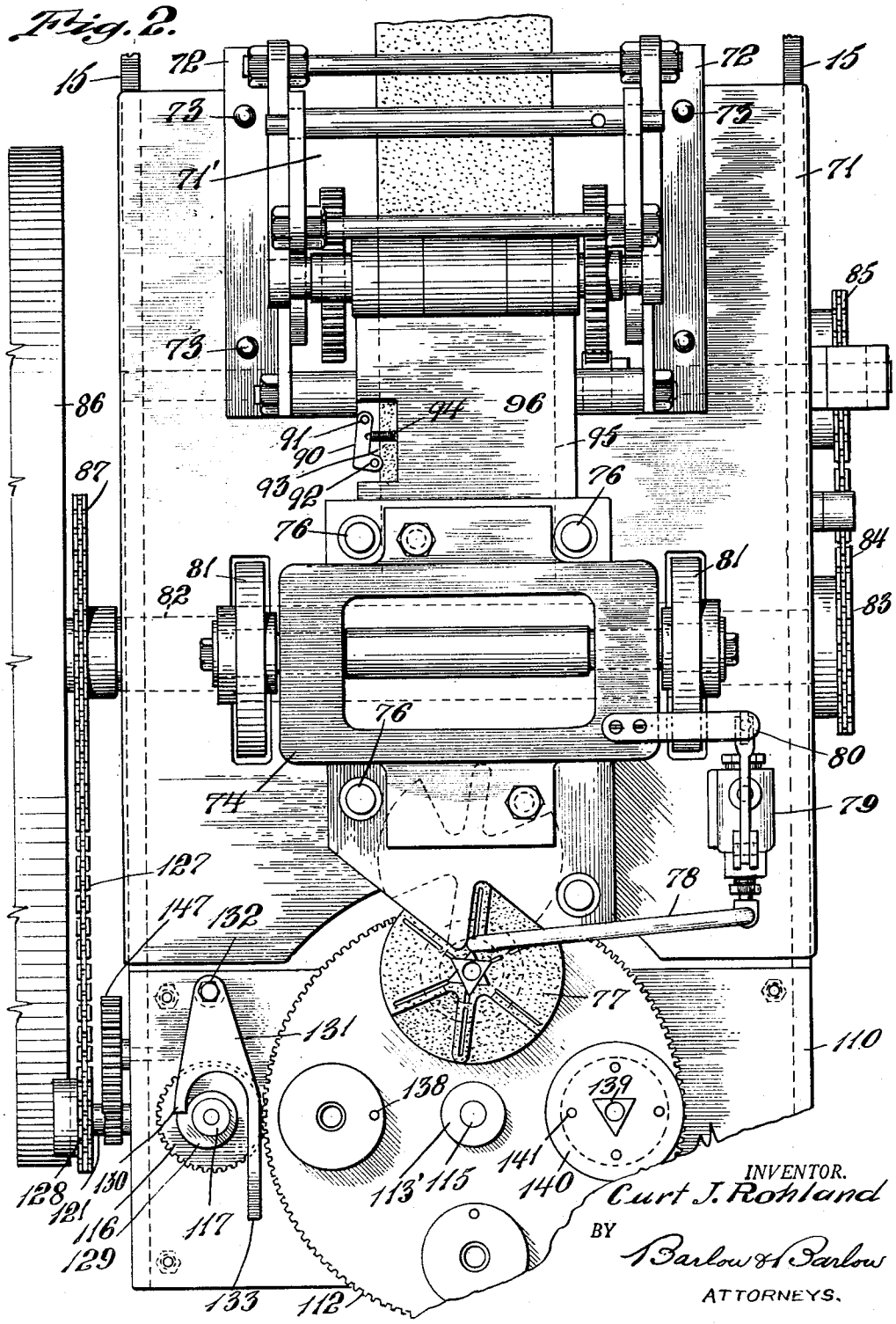
INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

May 22, 1951 C. J. ROHLAND 2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Filed Aug. 28, 1946 5 Sheets-Sheet 2

Fig. 2.



INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

May 22, 1951 C. J. ROHLAND 2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Filed Aug. 28, 1946 5 Sheets-Sheet 3

Fig. 3.

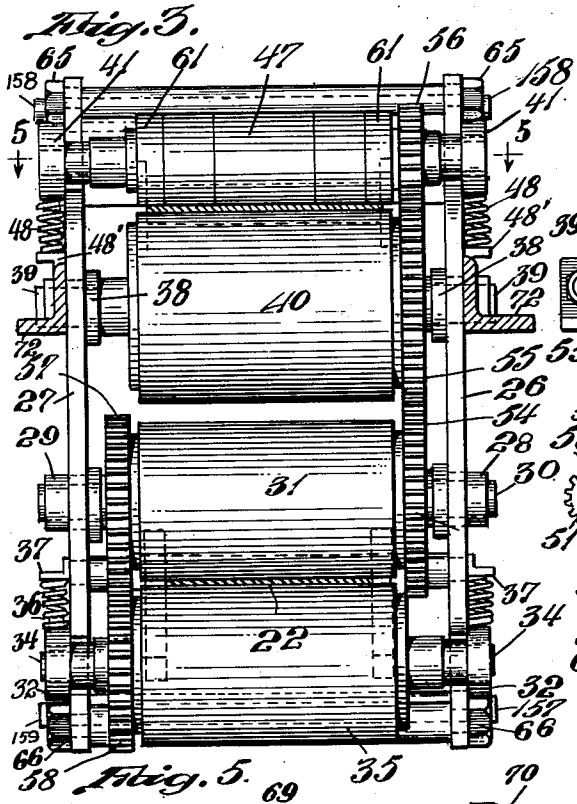


Fig. 4.

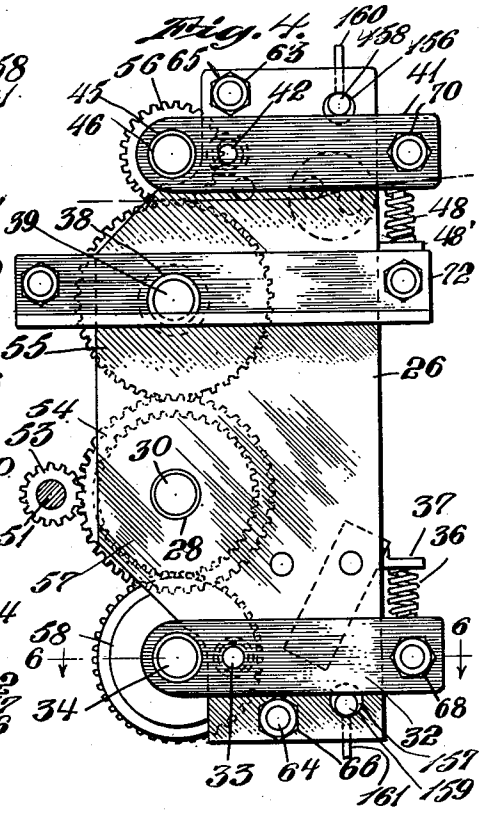


Fig. 5.

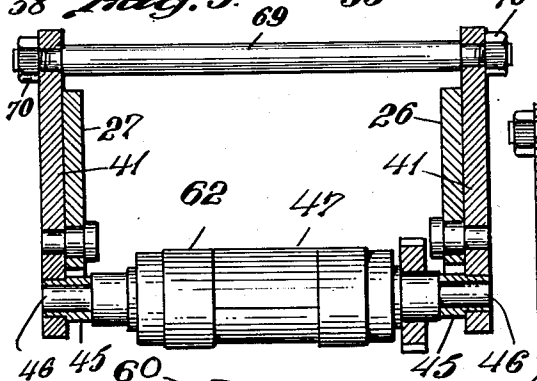


Fig. 6.

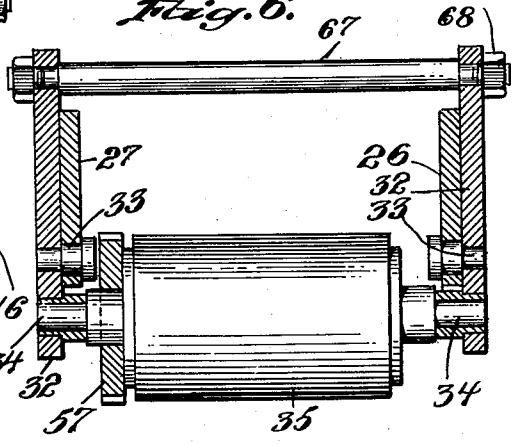
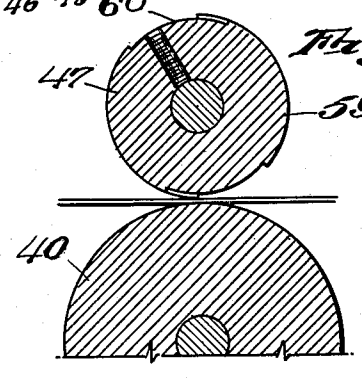


Fig. 7.



INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

May 22, 1951 C. J. ROHLAND 2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Filed Aug. 28, 1946 5 Sheets-Sheet 4

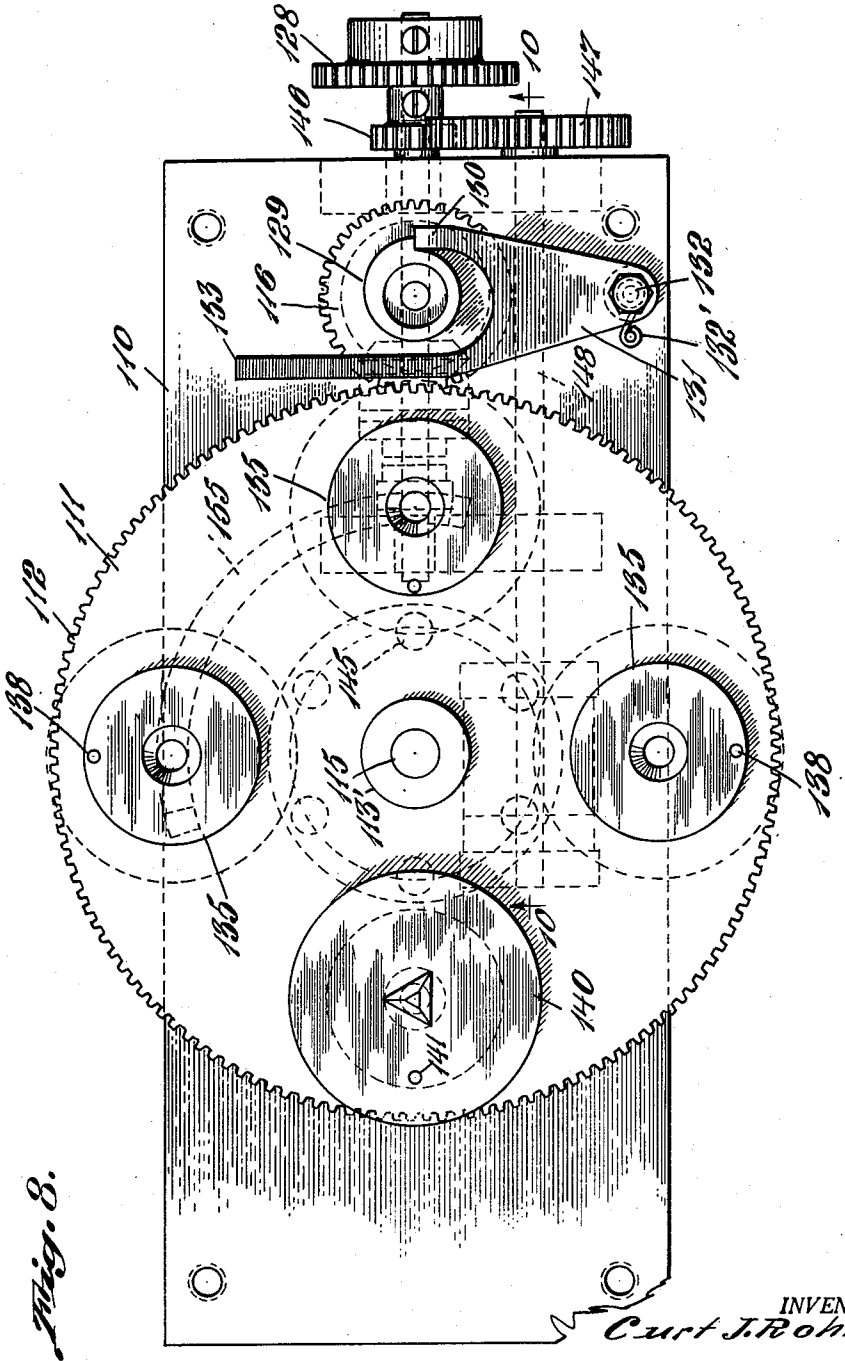


Fig. 8.

INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

May 22, 1951 C. J. ROHLAND 2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Filed Aug. 28, 1946 5 Sheets-Sheet 5

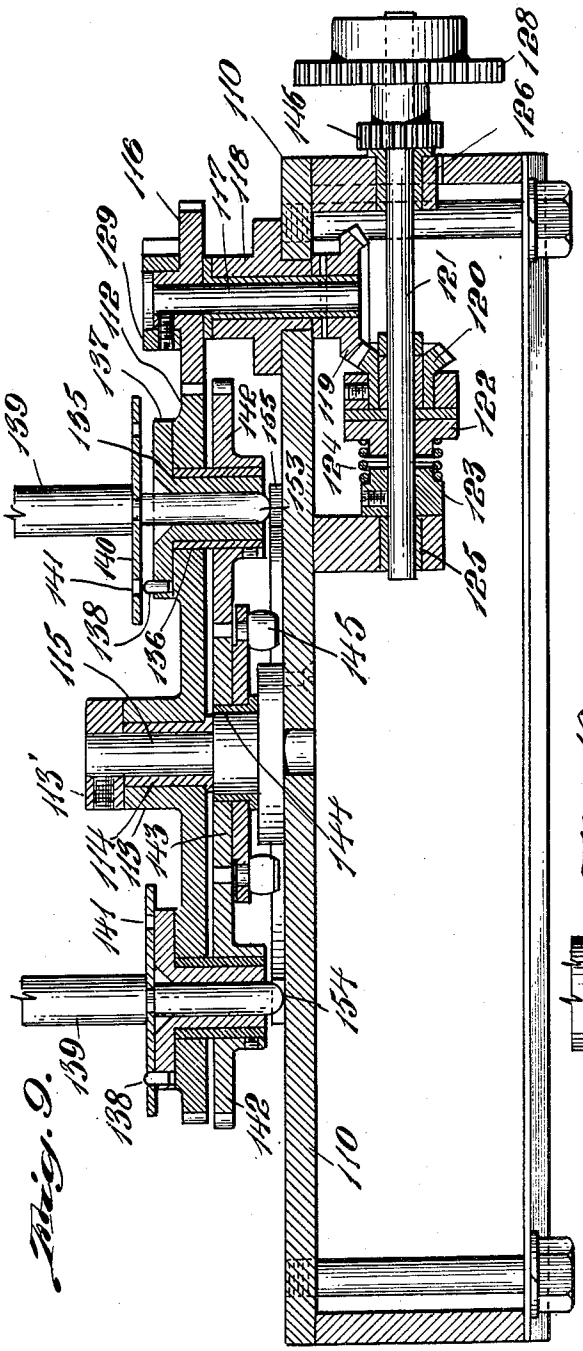


Fig. 9.

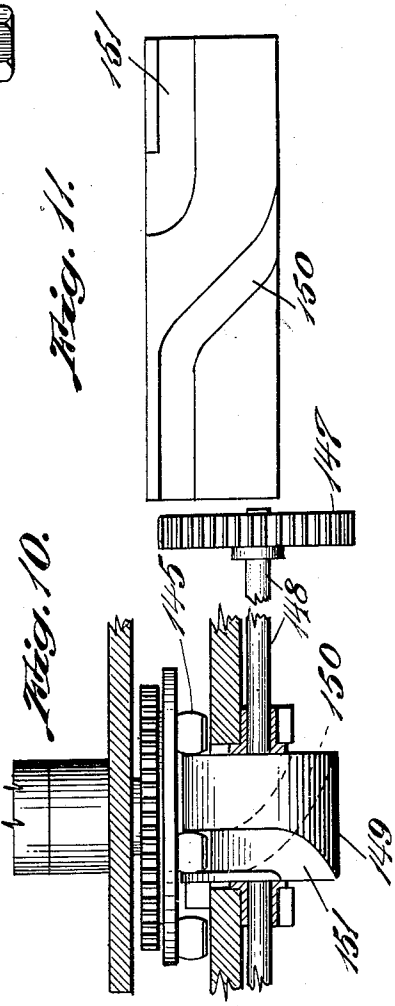


Fig. 10.

Fig. 11.

INVENTOR.
Curt J. Rohland
BY
Barlow & Barlow
ATTORNEYS.

Patented May 22, 1951 2,553,834

UNITED STATES PATENT OFFICE

2,553,834

MACHINE FOR MAKING FILTER ELEMENTS

Curt J. Rohland, Seekonk, Mass., assignor to Fram Corporation, a corporation of Rhode Island

Application August 28, 1946, Serial No. 693,597

1 Claim. (Cl. 93—1)

1

This invention relates to a machine for making filter elements.

Filter elements which consist of a stack of sheet members such as paper members may be cut from a sheet of paper and assembled in stack formation. The assembly depends to a large extent upon the shape and formation of each of the sheet members and in some cases different members are of different formation. In the element which is made by the machine of this present invention the sheet paper members are of identical formation which requires in assembly that some relative movement occur between the adjacent members in order that the stack may be properly formed.

One of the objects of this invention is to provide a machine which will draw from a coil supply of paper web the required web for the formation of each member and will cut from the web the member required and then stack these members in the proper relation all automatically.

Another object of this invention is to provide a feed for the paper web which will accommodate different thicknesses of paper.

Another object of this invention is to provide each of the stations where an operation occurs as an individual unit so that such unit may be taken from the frame of the machine and another unit substituted in case repairs are necessary on any one part. Thus, the machine may continue to operate with a small change while repairs are being made.

Another object of this invention is to present the web in a loose formation to the final feeding means so that the web being pulled from the supply package will not affect the feed.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings:

Fig. 1 is a side elevation of the machine showing the various operating units in position;

Fig. 2 is an enlarged plan view of the feed portion of the machine where the feeding, cutting, and assembling operations occur;

Fig. 3 is an elevation looking at the forward side of the feeding unit and showing in section the framework to which the feeding unit is attached;

Fig. 4 is a side view of the structure shown in Fig. 3;

Fig. 5 is a horizontal sectional view taken on substantially line 5—5 of Fig. 3, looking at the upper roll of the feed unit;

Fig. 6 is a horizontal section taken on substantially line 6—6 of Fig. 4, showing the lower roll of the feed unit;

Fig. 7 is a vertical sectional view showing the relationship of the upper feed roll and the roll next below it;

2

Fig. 8 is a plan view showing the assembly carrier unit of the machine;

Fig. 9 is a sectional view showing the structure in Fig. 8 in section;

Fig. 10 is a sectional view on a larger scale illustrating the cam for rotating each of the individual spindles on the carrier and taken on substantially line 10—10 of Fig. 8 with the shaft broken away;

Fig. 11 is a plan view of the cam slot unrolled as shown in Fig. 10.

In proceeding with this invention, I provide a framework upon which the various units forming the different stations are positioned. The supply package or roll of web material from which the members are cut is shown at A in Fig. 1. The feeding unit is the next station of the machine and is illustrated at B in Fig. 1. The dies for cutting from the sheet stock the filter members to be assembled is the next station and designated C in Fig. 1 while the assembly unit is the last station and is designated D in Fig. 1. These units are each separate and may be bolted upon the framework or taken therefrom as desired. They are, however, all driven in unison from a common power source which is a motor designated E in Fig. 1 which drives a fly wheel on a power shaft from which the power is supplied by a belt or chain means to all of the various units.

With reference to the drawings in greater detail, a skeleton framework is designated generally 10 and consists of three pairs of upright standards 11, 12, and 13 which are tied together by horizontal stringers 14 and 15 and suitably joined together by cross stringers which are not shown in the drawings. An axle or journal 16 is supported in bearings 17 resting and fastened to the stringers 14. On the axle 16 there is rotatably mounted the spirally wound web of paper material 18. In order that this paper may be more easily elevated into position a ramp 19 extends from a point adjacent the bearing 17 and is supported by legs 20. A single ply of paper web 21 is drawn from the package 18 through a pair of feed rolls positioned in the lower part in the unit B and then is looped down about the supply package 18 as shown at 22 and thence extends upwardly as at 23 over a guide 24 which consists of a rod between the two upright supports 11 and thence the web at the portion 25 extends again to the feeding unit to be advanced by an upper pair of feed rolls to the action of the dies.

This feeding unit is illustrated in greater detail in Figs. 3–7 inclusive and consists of a pair of spaced plates 26 and 27 between which are mounted the upper and a lower pair of feed rolls. An axle 30 is journaled in bearings 28 and 29 in the plates 26, 27 and rotatably supports the feed roll 31 of the lower pair of feed rolls. A pair of arms

32 are pivotally supported on pins 33 and carry bearings mounting the shaft 34 upon which the feed roll 35 is rotatably supported. Springs 36 press upon the outer ends of the arms 32 and act against abutments 37 carried by the plates 26 and 27 so as to swing the arms 32 and cause the roll 35 to move toward the roll 31.

At the upper portion of the plates 26, 27 bearings 38 are provided. In these bearings is journaled an axle 39 which rotatably supports the roll 40. At a point above this roll 40 there is a pair of arms 41 which are pivotally mounted at 42 and carry bearings 45 in which is journaled an axle 46 which rotatably mounts the feed roll 47 of the upper pair of feed rolls. These arms 41 are swung about their pivots by springs 48 which abut against each of the arms 41 and abutments 48'. The springs tend to swing the arms about pivots 42 so that the roll 47 will move toward the roll 40.

At a point fixed in the framework of the machine on the horizontal stringer 15 there is mounted a bearing 50 (Fig. 1) for a shaft 51 on which is mounted a gear 53 (Fig. 4) which serves to drive the feeding unit. The gear 53 meshes with a gear 54 on the shaft 30 which gear 54 in turn drives a gear 55 on the shaft 39 of the roll 40 and in turn drives gear 56 on the shaft 46 of the roll 47.

The other end of the shaft 30 which is driven by the gear 54 is provided with a gear 57 (Fig. 3) which drives the gear 58 on the shaft 34 upon which the roll 35 is mounted.

The rolls 31, 35 are continuous cylindrical surfaces and engage the web of paper 22 as shown in Fig. 3 between them to constantly feed this paper and draw it from the supply package 18. The paper then is looped about the package as previously described and enters between the rolls 40 and 47. The roll 40 is a continuous cylindrical surface while the roll 47 (see Fig. 7) is a mutilated cylindrical surface having a high portion 59 and a low portion 60 which will not grip the paper, there being barriers at the outer surface as at 61. This high portion is made up of several sections 62 (Fig. 5) which may be adjusted so as to provide a greater or lesser extent of high surface portion 59 for gripping paper of different thicknesses.

The plates 26, 27 are tied together and held in spaced relation to each other by tie rods 63, 64 which have reduced end portions that extend through the plates. The reduced end portions of the rods are threaded for receiving nuts 65, 66 which bind the plates between the nuts and the shoulders formed on the rods by the reduced end portions. The arms 32 are similarly tied together and held in spaced relation by means of the rods 67 and nuts 68 (Fig. 6). Arms 41 are likewise tied together by means of rods 69 and nuts 70 (Fig. 5). The feed unit is mounted on the bed plate 71 of the machine by angle iron pieces 72 (Fig. 2) which are fastened to the outer side of the plates such as by welding. The angle irons rest on the bed plate 71 about the edges of an opening 71' therein through which extends the lower portion of the feed unit. Bolts 73 may be employed for detachably securing the feed unit in position.

The unit C comprises a stationary die block 74 and a die block 75 which is movably mounted on guide pins 76. On these die blocks are mounted or otherwise provided the cutting elements (not shown) of the dies. The dies may be of any suitable form, that herein employed are of the progressive type wherein the cutting elements are chosen and arranged in a manner that the severing of the blank from the web is divided into several operations or steps. The blank to be cut remains fixed to the web while being advanced to the last step where the blank in the form of members shown generally at 77 in Fig. 2 is severed entirely from the web at a point over the assembling mechanism and discharged from the die onto a suitable spindle on the assembling mechanism and is assisted in such movement by a blowing of compressed air thereon conducted through the tube 78 and controlled by valve 79. At each reciprocation of the die an arm 80 opens the valve and permits compressed air from a suitable source of supply to be passed through the conduit 72.

The die block 75 is reciprocated on guide pins 76 by means of arms 81 suitably joined to the block 75 and eccentrically mounted on the main drive shaft 82.

One end of the drive shaft 82 carries a sprocket gear 83 over which passes a sprocket chain 84 that engages a sprocket gear 85 secured to the shaft 51 to drive the same. At the other end of the drive shaft 82 is mounted the fly wheel 86 and a gear wheel 87 from which other movable parts of the machine derive power.

In order to maintain the web properly aligned as it is advanced to the action of the dies, a spring pressed arm 90 is provided. The arm is pivoted at 91 to the bed plate 71 and has a pin 92 at the free end thereof which depends therefrom into engagement with the edge 93 of the web. A pull spring 94 is secured to the arm in a manner so as to bias the arm toward the web to cause the pin 92 to maintain the opposite edge of the web against an abutment 95 which is provided by the turned edge of a plate 96. The web travels in the space between the plate 94 and bed plate 71, the spacing between these plates is such as to provide a restricted passage for the web so as to aid in preventing the same from buckling when being moved toward the die.

Assembling mechanism

The assembly mechanism, although shown to some extent in Figs. 1 and 2 is more fully shown in Figs. 8 to 11. A bed plate 110 mounts a rotary carrier 111 which is provided with gear teeth 112 at its edge. This rotary carrier is provided with a central boss 113 having an opening extending therethrough for receiving a bearing bushing 114. A vertically disposed stud 115 extends upwardly from the bed plate 110 and is fixed thereon against rotation. The stud extends through the bushing 114 to rotatively support the carrier in position. A collar 113' is received on the end of the stud 115 and by means of a set screw secures the collar to the stud which locks the carrier thereto. The teeth 112 of the carrier mesh with a gear 116 which is mounted upon a shaft 117 in the bed plate 110 and suitably supported in a sleeve 118 below it. At the lower end of this shaft 117 is a beveled gear 119 in mesh with another beveled gear 120 which is driven by shaft 121 through a friction clutch mechanism 122 and 123. The friction clutch is under influence of spring 124 and is continually tending to drive the beveled gears and the shaft 117. The shaft 121 is mounted in bearings 125 and 126 and is driven by means of a sprocket chain 127 engaging the gear 128 and drive gear 87 on the main drive shaft. A cam 129 is fixed upon the upper end of the shaft 117 so as to rotate therewith and is engaged by the arm 130 of a member 131 which is pivoted at 132 and has another arm 133 serving as a handle. When the arm 133 is rocked

so as to release the cam 129, the carrier will rotate the distance of one revolution of the gear 116 so as to move the carrier through a portion of a revolution.

The ratio of the number of teeth in gear 116 and gear teeth 112 is such that the carrier will be moved one quarter of a revolution so as to position one of the four spindles, which in the instant case is mounted on this carrier at a loading location. The arc of movement, however, will depend upon the number of spindles which are utilized.

After the arm 133 is swung to permit the starting movement of the cam, the arm 133 is then released and the arm 130 will again move under the bias of a torsion spring 132' back into a position to engage the cam and stop motion after one revolution has been made. This is a manual control which the operator must perform although it will be readily apparent that automatic mechanism might be provided for accomplishing this. The carrier 111 is provided with a plurality of rotary members 135 mounted in openings 136 in the carrier. These members consist of a flange 137 upon which there is mounted a pin 138 and each member receives a spindle 139 which has a flange 140 provided with an opening 141 to receive the pin 138. These members 135 below the carrier each have a gear 142 fixed thereto, which gears mesh with a center gear 143 which is mounted on the bearing 144 of the center stud 115. This center gear is also provided with a plurality of knobs 145 which are located angularly dependent upon the pattern of the member which is cut from the dies. Six are provided in the instant case as the lobes of the members cut are at intervals of 60 degrees of rotation. These knobs 145 serve as a means for rotating the gear 143 and the gears 142 in mesh with it. In other words, to drive the center gear 143 I have provided a gear 146 on the shaft 121 and have meshing with it a gear 147 on the shaft 148 as shown in Fig. 8 while upon this shaft 148 (see Fig. 10) there is mounted a cam member 149 having slots 150 and 151 therein. This cam member engages one of the knobs 145 as shown in Fig. 10 and will rotate this knob through an arc dependent upon the channel formed in this cam member which will be through 60 degrees by reason of the timed relation between the rotation of the shaft 148 and the drive of the machine. In other words at each reciprocation of the die a rotation of 60 degrees on the spindle will be provided. The spindles will all rotate except such spindles as are raised so as to disengage the opening 141 and pin 138. Each of the spindles 139 has a portion 153 extending through the member 135 with a rounded end as at 154. This rounded end may ride upon a track 155 carried by the bed plate 110 so as to raise the spindle from locking engagement with the member 135 to prevent rotation thereof. This raised track will occur from the point immediately after loading to a point at the first stop after loading so as to permit the operator to easily remove either the spindle and replace it with another spindle or permit the stacked members to be lifted from the spindle for subsequent operations to hold them in assembled relation.

The operation of the several parts of the machine has been given in connection with the detailed description thereof and a brief general description of the operation of the apparatus as a whole will suffice in order to clearly understand its mode of operation. The paper web is advanced by the feed unit to the action of the dies which severs the members 77 from the paper web in a progressive order. The last step in the operation of the dies to entirely sever the blank from the web is performed adjacent a spindle 139 which receives the blank as discharged from the dies with the aid of compressed air acting on the blank. In timed relation with the reciprocation of the die blocks the spindle which is being loaded is moved a partial rotation by the gear train 143, 142 operated through the action of cam 149, through knobs 145 so as to properly relate the members 77 to each other on the spindle.

In order to facilitate inserting the web between the pairs of feed rolls 31, 35 and 40, 47, means are provided for manually moving one of the rolls of each pair away from its companion roll. The means comprises similar members 156, 157, each formed with eccentric end portions 158, 159 respectively. The member 156 is mounted for rotary movement in the plates 26, 27 with the eccentric end portions 158 extending beyond the plates so as to overlay the upper edge of the arms 41 on the side of the pivot distal from roll 47. The portions 158 are normally spaced from the arms 41 sufficiently so as to permit ample clearance for the required limited movement of the arms 41 under urge of springs 48 to assure contact of the feed rolls with the web.

The member 157 is similarly mounted but with the eccentric end portions 158 extending beneath the lower edge of the arms 32. Each member 156, 157 is provided with a handle 160, 161 for the manual rotation of the members so as to move the portions 158, 159 in a proper direction to engage and swing the arms 32, 41 about their pivots 33, 42 and move the respective roll carried by each pair of arms from its companion roll. Movement of the members 156, 157 in the opposite direction will return the feed rolls to web engaging relation.

I claim:

A machine for making a filter element formed of a stack of sheet members comprising a supporting frame, a plurality of stations for forming said members and a terminal assembly station for receiving and assembling the sheet members comprising a rotary carrier having a plurality of spindles each for the assembly of a stack of members and means to rotate said carrier through a part of a revolution to successively locate one of said spindles at a time in a position to receive a stack of members thereon and position other of said spindles in an inoperative position for discharge of the members stacked thereon and means to intermittently rotate each spindle with reference to the carrier through a part of a revolution when in position to receive said members.

CURT J. ROHLAND.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,466,034	Snyder	Aug. 28, 1923
1,540,336	Huyett	June 2, 1925
1,591,547	Paridon	July 6, 1926
1,870,151	Swangren	Aug. 2, 1932
1,983,471	Kramer	Dec. 4, 1934
2,098,642	Cude	Nov. 9, 1937
2,283,629	Heftler	May 19, 1942