Dec. 1, 1942. R. E. HART 2,303,635

STRIP ALIGNING AND FEEDING DEVICE

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FIG.1.

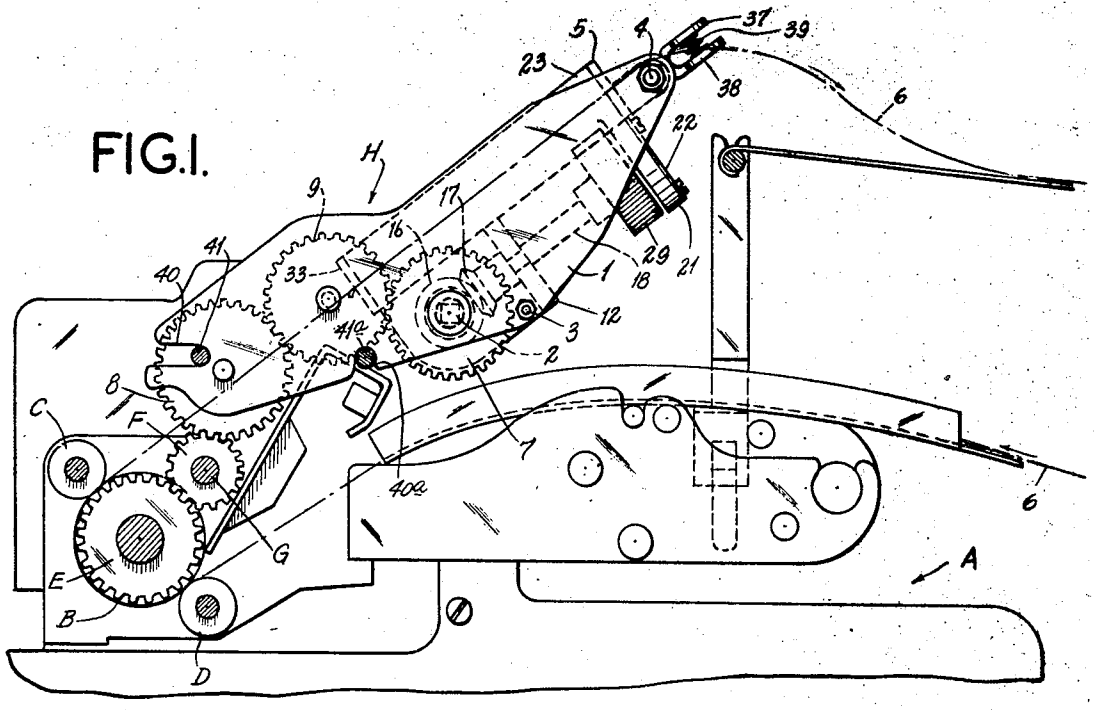


FIG.3.

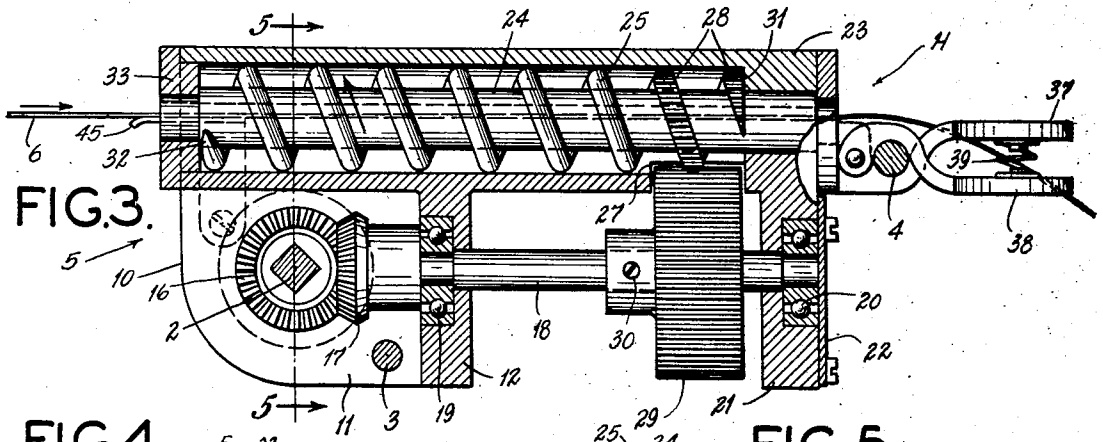


FIG.4.

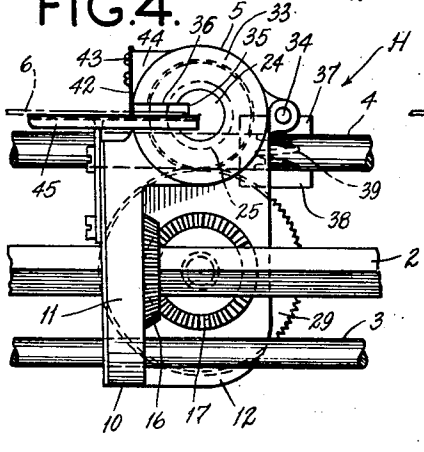
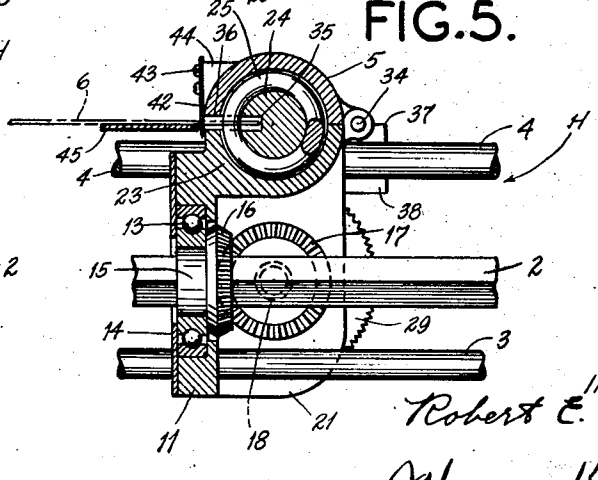


FIG.5.



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STRIP ALIGNING AND FEEDING DEVICE

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FIG. 2.

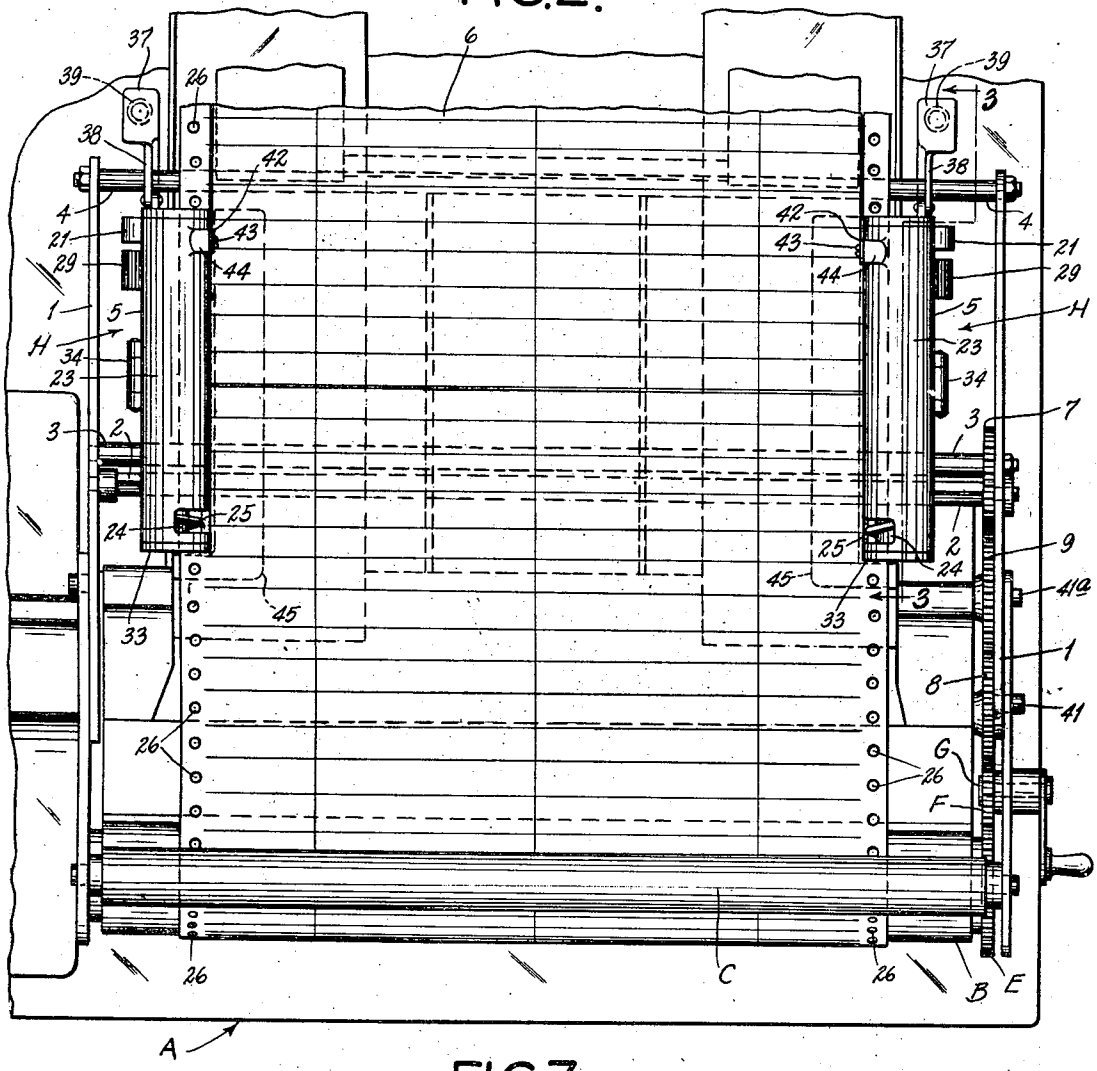
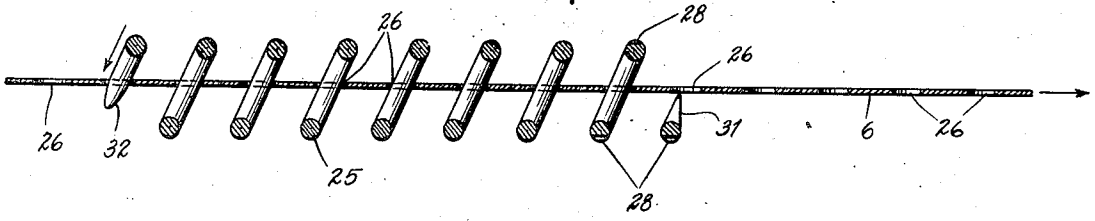


FIG. 7.



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STRIP ALIGNING AND FEEDING DEVICE

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FIG.6.

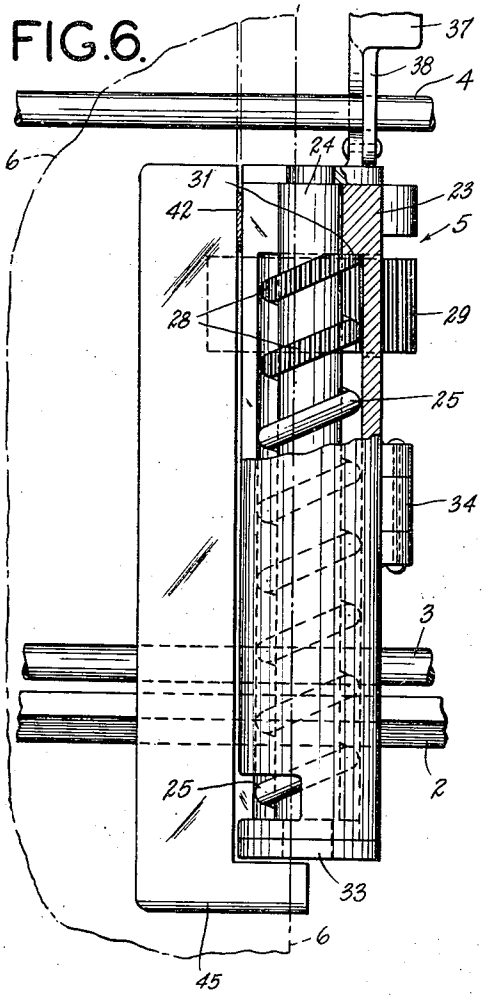


FIG.8.

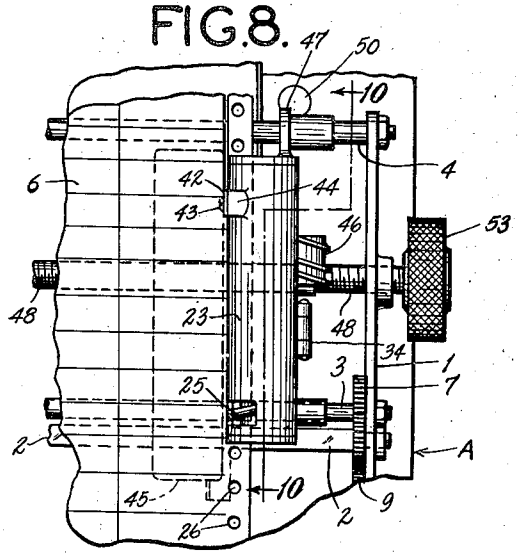


FIG.9.

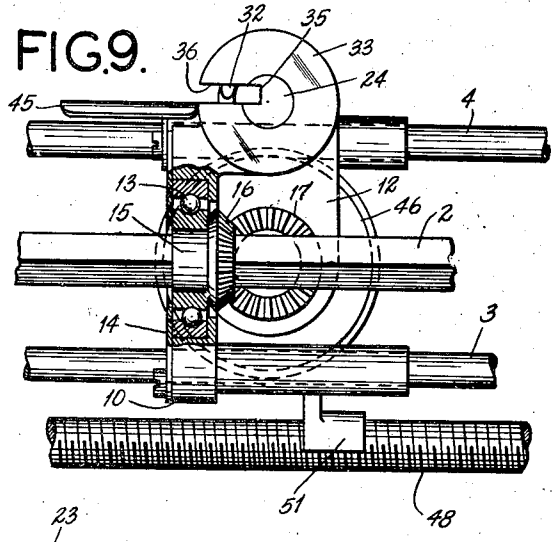
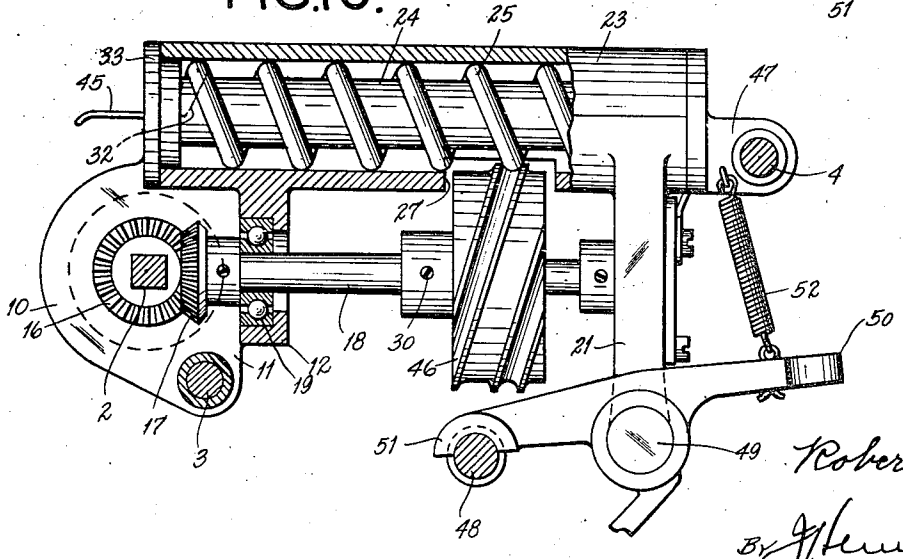


FIG.10.



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2,303,635

UNITED STATES PATENT OFFICE

2,303,635

STRIP ALIGNING AND FEEDING DEVICE

Robert E. Hart, Poughkeepsie, N. Y., assignor, by mesne assignments, to American Lithofold Corporation, St. Louis, Mo., a corporation of Missouri

Application November 27, 1940, Serial No. 367,434

16 Claims. (Cl. 271—2.3)

My invention relates to strip feeding and aligning devices and more particularly to such devices arranged to feed and align punched or perforated strips of various kinds through a machine of any type.

In this application I have shown and described my invention embodied in a device for feeding and aligning continuous forms while passing through a tabulating machine. However, my new and improved feeder and aligner may be embodied in other imprinters, or may be used in conjunction with strips of other materials passed through other machines. Some of the uses I have in mind for my device are in connection with perforated Celluloid films in moving picture apparatus, with punched cardboard patterns in Jacquard looms or in automatic embroidery organizations, with barometers, recording thermometers or other instruments using movable charts, or with type casting machines using tape motivators.

Heretofore, in feeding and aligning devices included or used in combination with apparatus of this general type, the movable mechanism comprised pins carried by and projecting from a wheel or belt and the pins were arranged to engage successively in a series of punches or perforations in the strip being fed through the device. There has always been difficulty in maintaining the strip in proper position so that the perforations would register accurately with the pins which, of necessity, entered these openings at an angle. Furthermore, if the strip was thick or consisted of a plurality of superposed parts, as in the case of continuous tabulating forms, difficulty was encountered in keeping the strips in engagement with the pins. These deficiencies of the structures used in the past are well recognized and the feeding devices have been changed and redesigned in attempts to obviate faulty operation. The attempts have failed, though, for the most part.

The objects of my invention are to provide a strip feeding and aligning device which will be greatly improved in construction and operation over those heretofore available; to provide such a device wherein the movable feeding element remains in constant engagement with a portion of the strip during the entire time that the portion is passing through the device; and to provide a strip feeding and aligning device which may be used with great utility and efficacy in combination with various types of machines.

In the accompanying drawings, wherein similar characters are used to designate similar parts, as stated above, my invention is shown, for illustrative purposes, in conjunction with a tabulating machine and a continuous, marginally perforated form passing therethrough. In these drawings, Fig. 1 is an end view of the device and parts of the machine on which it is mounted; Fig. 2 is a plan view of the device as in Fig. 1 and with a continuous form threaded therethrough; Fig. 3 is a sectional view, along the line 3—3 in Fig. 2, of one of the feeding and aligning units; Fig. 4 is an end view of the unit; Fig. 5 is a cross section along the line 5—5 in Fig. 3; Fig. 6 is a plan view, partially broken away, of this unit; Fig. 7 shows diagrammatically the movable element of the unit and its relation to the marginal perforations in the form; Figs. 8 and 9 are a plan and an end view, partly in section, respectively, of a modified device including my invention; and Fig. 10 is a cross section of said modification, along a line 10—10 Fig. 8.

Referring to Figs. 1 to 7 inclusive, a strip feeding and aligning device illustrated therein as an embodiment of my invention, is mounted, as shown in Figs. 1 and 2, on a tabulating machine, shown only in part and generally indicated at A. This tabulating machine, of course, is no part of my invention except as insofar as my device is combined therewith and this machine includes a power driven platen B against which is done imprinting by the machine and which has asociated therewith upper and lower pressure rollers C and D, respectively.

On one end of the platen B is a gear E meshing with a gear F fixed to the power shaft G and arranged to drive, in addition to the platen, a driving gear for the feeding and aligning device, in the manner more fully described below. The strip feeding and aligning device in the drawings is indicated generally at H and comprises a pair of end plates 1, each of which has notches 40 and 40a formed therein and adapted to engage studs 41 and 41a, respectively, carried by the tabulating machine head, whereby the end plates 1 and the device H carried thereby may be mounted removably in operable relation to the tabulating machine.

The device G comprises, in addition to the end plates 1, a square drive shaft 2 and a pair of guide rods 3 and 4, all of which extend between the end plates 1 and, preferably, are arranged parallel to the axis of the platen B. Mounted on and carried by the shaft 2 and guide rods 3 and 4, so as to be slidably adjustable and longitudinally movable therealong, is a pair of feed-

ing and aligning units 5. The aligning units 5 are similar excepting that the parts thereof are partially reversed in position so that each of the aligning units is arranged to have a marginal portion of a continuous form 6 threaded therethrough. This continuous form 6 is no part of my invention. Similar forms are old in the arts, are in common usage and, hence, may be of any size and shape and may include one part or many parts interleaved with carbon paper and arranged in superposed registering relation.

The movable feeding and aligning mechanism, to be described below, of each of the aligning units 5, is driven by the square drive shaft 2 which has fixed to one end thereof a gear 7 driven from the drive gear F of the tabulating machine through intermediate gears 8 and 9, mounted on studs extending from an end plate 1. Preferably, as shown in Fig. 1, the gears 7, 8 and 9 are of the same diameter as the gear E on the tabulating machine platen B and, hence, the gear 7 will be driven at the same speed as the gear E and, through complementary transmission means to be described below, the movable feeding mechanism of the aligning unit will be motivated to cause the form to travel through the unit at the same speed as it travels on the surface of the platen B between imprinting operations.

Each of the aligning units 5 has a frame 10 of any suitable shape and arrangement to carry and accommodate the various parts and having a pair of webs 11 and 12, as shown in Figs. 3 to 5, inclusive, arranged at right angles to one another. The web 11 is bored to receive a ball bearing 13 held in place by a plate 14 and, in turn, receiving, within its inner race, a hub 15 having a square central opening through which projects the square shaft 2 of approximately the same cross sectional area as the opening in the hub. Carried by the hub 15 is a miter gear 16 in mesh with a similar miter gear 17 fixed to a shaft 18 mounted in a ball bearing 19 carried by the web 12 and in a ball bearing 20 carried by a block 21 and held in place therein by a plate 22.

In this embodiment the guide rod 3 has a slidable fit through the web 11. Each unit 5 also comprises a barrel 23 and a mandrel 24. Centered axially in the mandrel 24 is a helix 25 which may be of any material but, preferably, is formed of stiff wire having a diameter substantially the same or slightly less than the diameter of the marginal perforations 26 in the form 6. Several turns of the helix 25, at a point where their outer peripheries are exposed through an opening 27 in a wall of the barrel 23, are provided with teeth 28, shaped, positioned, and arranged to mesh with the teeth on a gear 29 fixed to the shaft 18, as by the set screw 30, and having a portion of its periphery extending into the opening 27. It is obvious that the helix 25 will be rotated about the mandrel 24 when the gear 29 is driven by the shaft 18, through the miter gears 16 and 17 from the shaft 2, which shaft, in turn, is driven by the power shaft G of the tabulating machine through the gears F, 8, 9 and 7.

The end of the helix 25 near the point where it is engaged by the gear 29, as indicated at 31, is cut at an angle so that it will bear firmly against the adjacent end wall of the hollow interior of the barrel 23. Also, the other end of the helix, indicated at 32, is formed with a blunt point, one portion of which bears against the other end wall of the barrel, which end may be removable, two piece plug 33 whereby the helix 25 may be slipped off of the mandrel 24 when the plug 33 is removed. If the ends of the helix bear against the end walls of the hollow interior of the barrel, as just described, the helix will be maintained in predetermined position longitudinally on the mandrel 24 as it rotates thereabout. The barrel 23 may be formed in two longitudinally meeting parts hinged as at 34 so that, when the parts are swung away from one another, the hollow interior of the barrel and the mandrel 24 and helix 25 contained therein may be exposed for cleaning or examination. The mandrel 24, of course, must be maintained in fixed position and it has a channel 35 extending from end to end longitudinally thereof and registering with a slot 36 extending from end to end in the wall of the barrel 23, all as shown in Fig. 5 and for the purposes fully set forth below.

As stated above, the units 5 are manually adjustable on and longitudinally slidable along the shaft 2 and guide rods 3 and 4 so that a variety of form widths may be accommodated therebetween in the manner shown in Fig. 2 with each of the perforated marginal portions of a form projecting laterally into and extending longitudinally through the slot 36 and channel 35. After the units 5 have been moved into proper position, as shown in Fig. 2, it is best that the units be maintained in adjusted position. Therefore, in the embodiment of my invention being described now, I prefer that each of the units 5 be provided with a clamp engaging the guide rod 4. Each clamp consists of a fixed member 37 and a pivoted member 38 crossing one another and impelled into clamping position by a spring 39. When the finger grips of the members 37 and 38 are moved towards one another the crossing arm of the member 38 will be moved laterally between the end plates 1, but, when the members are released, the spring 39 will move the member 38 to clamp the rod 4 between the cross arms of the members and the unit will be maintained in fixed laterally adjusted position.

The use and operation of the strip feeding and aligning device, shown in Figs. 1 to 7 of the drawings and described above, as embodying my invention, when applied to a tabulating machine, is as follows:

If the device has been mounted on the machine by means of the cooperating notches 40 and 40a and studs 41 and 41a with the gear 8 of the aligning device in mesh with the gear F of the machine, when the power shaft G is operated the helix 25 will be driven in the direction indicated by the arrows in Figs. 3 and 7 so that the point 32 thereof will pass intermittently downwardly across the space between the channel 35 and slot 36 and, similarly, the opposite end 31 of the helix will pass intermittently downwardly across that space.

The units 5 are adjusted laterally, in the manner described above, to accommodate the width of the continuous form being passed through the machine in which adjusted position the marginal portions of the form each will register with the channel 35 and slot 36 of one of the units 5 and the series of perforations 26 in the form will register with the space between the channel and the slot, in which space the helix 25 moves. After such adjustment the free end of each marginal portion is threaded into the opening of the slot and channel at the end of a unit nearest the platen B. Preferably, the helixes 25 are arranged so that they rotate uniformly, that is, at any

point of rotation the ends 31 and 32 of one helix will be at the same relative position as the other. Therefore, when the marginal portions are threaded into the unit and the units are rotated manually, the pointed ends 32 will move downwardly simultaneously across the space between the channel 35 and slot 36 and through longitudinally registering perforations in such marginal portions. It will be obvious, that, as rotation of the helixes 25 is continued, the movement thereof, in engagement with the perforations 26 will cause the form to be drawn into and to be passed through the unit. When any given perforation has been engaged successively by the helical windings it will finally leave the unit and will be disengaged at the end 31. Of course; after the free end of each marginal portion has been threaded into the unit the machine may be operated mechanically by its source of power, usually an electric motor, not shown, and the helixes 25 will be rotated from the power shaft G driven by the motor. The relation of a marginal portion of the form with its coincident helix 25 is clearly shown in the schematic view of Fig. 7.

If it is desired to shear the marginal portions from the body of the form as it passes through the aligning device a knife 42 may be mounted on each unit at the proper position by any suitable means such as a set screw 43 extending into a boss 44 formed on the upper part of the barrel 23 of each unit. This shearing arrangement may be of any type and may be effected at any point during the travel of the form. A guide plate 45 may be arranged on each unit to support the form as it passes therethrough.

In the embodiment shown in Figs. 8 to 10 inclusive, the helix 25 of each unit is driven by a worm 46 fixed to the shaft 18 in the same manner as is the gear 29 in the previously described embodiment. Further, in this modified form of my device the means for laterally adjusting the units for forms of varying widths has been changed. The guide rod 4 extends through a boss 47 formed on each unit. A threaded shaft 48 is positioned parallel to the shaft 48 is threaded in reverse directions from its median point toward each end thereof. The block 21 carries an extension 49 on which is pivotally mounted a trigger 50 carrying a jaw 51 threaded in the same direction as the end of the shaft 48 with which the jaw's unit is associated. A spring 52 normally impels the trigger 50 to clamp the jaw 51 on the shaft 48. When the unit is to be adjusted laterally the trigger 50 is pivoted manually to carry the jaw 51 out of contact with the shaft 48 and the unit may be slid into approximate adjusted position. After each unit thus has been primarily adjusted the triggers 50 are released to allow the jaws 51 to engage the shaft 48 with the threads on the jaws in mesh with the threads on the shaft. Secondary or final adjustment of the units is accomplished by manual rotation of the shaft 48 through the hand wheel 53. If the shaft 48 is threaded in reverse directions, as in this embodiment, the units 5 will be moved away from or towards one another depending upon the direction in which the shaft 48 is rotated.

Except for the method of lateral adjustment, this second form of my device is operated in the same manner as the first described embodiment. In any form of my invention I prefer that a helix 25 be rotated by a means, as for example, a gear 29 or worm 46, located at the rear end of the helix, that is, at the end toward which the form is moved when passing through the device. If the motivating force was arranged at the opposite end of the helix there might be a tendency, because of friction on the mandrel 24 and because of the engagement of the end 31 with the end wall of the hollow interior of the barrel 23, for the windings of the helix to be compressed and to be carried out of proper spaced relation for engagements with the perforations 26. If the motivating force is applied as in these embodiments such compression will be minimized and, in fact, will be obviated for all practical purposes.

If the marginal perforations and the helix 25 are arranged, as shown in connection with the two illustrated embodiments, when a section of the form has been started into the device it is necessary to pass that section entirely therethrough to avoid mutilation, because the section cannot be removed otherwise without tearing the marginal portion confined within each unit. To avoid this the marginal portions may be divided into longitudinally extending transversely separated areas, the perforations may be of modified key-hole shape having a slit or notch extending from each perforation to the adjacent edge of the form, or other expedients may be used so that the perforations may be moved laterally into or out of engagement with the turns of the helix, as desired, without mutilation of the form.

I do not intend to limit myself to the modifications of my invention shown and described herein. It will be understood clearly that a spiral or other volute may be used instead of a helix for the movable strip feeding mechanism and that the other parts of the feeding and aligning device may be varied within wide limits without departing from the essence of my invention as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A strip feeding and aligning device comprising a rotatably mounted volute maintained in fixed axial position and adapted and arranged so that the turns thereof will pass through aligned perforations formed in said strip when said volute is rotated whereby said strip will be moved longitudinally thereof.

2. A strip feeding and aligning device comprising a rotatably mounted volute maintained in fixed axial position and adapted and arranged so that the turns thereof pass through aligned perforations formed in said strip when said volute is rotated whereby said strip will be moved longitudinally thereof, and means for rotating said volute positioned at the end thereof toward which rotation tends to cause said volute to move.

3. A strip feeding and aligning device comprising a rotatably mounted volute arranged with its axis substantially parallel to the path of movement of said strip and being otherwise adapted so that when said volute is rotated the turns thereof will pass successively through said strip.

4. A strip feeding and aligning device comprising a rotatably mounted volute arranged with its axis substantially parallel to the path of movement of said strip and being otherwise adapted so that the turns thereof will pass successively through a given point in said strip when said volute is rotated, means for maintaining said volute in fixed axial position whereby as said volute is rotated said strip will be moved longitudinally thereof.

5. A feeding and aligning device for a strip having a longitudinally extending series of perfora-

tions formed therein, said device comprising a rotatably mounted volute arranged with its axis substantially parallel to the path of movement of said strip and being otherwise adapted so that the turns thereof will pass successively through said perforations when said volute is rotated, means for maintaining said volute in fixed axial position, whereby as said volute is rotated said strip will be moved longitudinally thereof.

6. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a rotatable helix arranged with its axis substantially parallel to the path of movement of said strip and adapted so that the turns thereof will pass successively through said perforations when said helix is rotated, means for maintaining said helix in fixed axial position, whereby as said helix is rotated said strip will be moved longitudinally thereof.

7. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a rotatably mounted helix arranged with its axis substantially parallel to the path of movement of said strip and adapted so that the turns thereof will pass successively through said perforations when said helix is rotated, the entering end of said helix being pointed to facilitate its passage through said perforations, means for maintaining said helix in fixed axial position whereby as said helix is rotated said strip will be moved longitudinally thereof, and means for rotating said helix positioned near the end thereof opposite said entering end.

8. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a rotatably mounted volute arranged with its axis substantially parallel to the path of movement of said strip and positioned with the edge of said strip within the turns of said volute, said volute being otherwise adapted whereby said turns will pass successively through said perforations when said volute is rotated, means for maintaining said volute in fixed axial position whereby as it is rotated said strip will be moved longitudinally thereof.

9. A strip feeding and aligning device comprising a housing having an elongated slot extending longitudinally thereof and adapted to have a marginal portion of said strip project laterally therein and extend longitudinally therealong, a volute rotatably mounted within the hollow interior of said housing and being maintained in fixed axial position and otherwise adapted so that the turns thereof will pass successively through a given point in said marginal portion when said volute is mechanically rotated, whereby said strip will be moved longitudinally thereof.

10. A strip feeding and aligning device comprising a housing having an elongated slot extending longitudinally thereof and adapted to have a marginal portion of said strip project laterally therein and extend longitudinally therealong, a helix rotatably mounted within the hollow interior of said housing with its axis substantially parallel to the edge of said marginal portion and being otherwise adapted so that the turns thereof will pass successively through a given point in said marginal portion when said helix is rotated within said housing whereby said strip will be moved longitudinally thereof.

11. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a housing having an elongated slot extending longitudinally thereof and adapted to have said marginal portion project laterally therein and extend longitudinally therealong, a helix rotatably mounted within the hollow interior of said housing and being otherwise arranged so that the turns thereof will pass successively through said perforations when said helix is rotated whereby said marginal portion will be moved longitudinally through said housing.

12. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a housing having an elongated slot extending longitudinally thereof and adapted to have said marginal portion project laterally therein and extend longitudinally therealong, a helix rotatably mounted within the hollow interior of said housing and being otherwise arranged so that the turns thereof will pass successively through said perforations when said helix is rotated, whereby said marginal portion will be moved longitudinally through said housing, the entering end of said helix being pointed to facilitate its passage through said perforations.

13. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a housing having an elongated slot extending longitudinally thereof and adapted to have said marginal portion project laterally therein and extend longitudinally therealong, a volute rotatably mounted within the hollow interior of said housing and being otherwise arranged so that the turns thereof will pass successively through said perforations when said volute is rotated, and means for rotating said helix positioned at the end of said housing opposite the end at which said marginal portion enters said slot.

14. A strip feeding and aligning device comprising a housing having an elongated slot extending longitudinally thereof, a mandrel positioned within the hollow interior of said housing but spaced from the side walls thereof, said mandrel having a channel formed therein in register with said elongated slot whereby a marginal portion of said form may project laterally into said housing and into said channel and may extend longitudinally therealong, a helix rotatably mounted on said mandrel in the space between said mandrel and the side walls of said housing, said helix being otherwise adapted and arranged whereby the turns thereof will pass successively through a given point in said marginal portion when said helix is rotated and whereby said marginal portion will be moved longitudinally through said housing.

15. A strip feeding and aligning device comprising a housing having an elongated slot extending longitudinally thereof, a mandrel positioned within the hollow interior of said housing but spaced from the side walls thereof, said mandrel having a channel formed therein in register with said elongated slot whereby a marginal portion of said form may project laterally into said housing and into said channel and may extend longitudinally therealong, a helix rotatably mounted on said mandrel in the space between said mandrel and the side walls of said housing, said helix being otherwise adapted and arranged whereby when said helix is rotated one end thereof will

enter said marginal portion at a given point and then said point will be engaged successively by the other turns of said helix and said marginal portion will be moved longitudinally through said housing, and means for rotating said helix positioned near the end thereof opposite said entering end.

16. A feeding and aligning device for a strip having a longitudinally extending series of perforations formed in a marginal portion thereof, said device comprising a housing having an elongated slot extending longitudinally thereof, a mandrel positioned within the hollow interior of said housing but spaced from the side walls thereof, said mandrel having a channel formed therein in register with said elongated slot whereby the marginal portion of said form may project laterally into said housing and into said channel and may extend longitudinally therealong, a helix rotatably mounted on said mandrel in the space between said mandrel and the side walls of said housing, said helix having its axis substantially parallel to the edge of said marginal portion and having the entering end thereof pointed whereby as said helix is rotated said entering end will pass successively through said perforations and then said perforations will be engaged successively by each of the turns of said helix and said marginal portion of said form will be moved longitudinally through said housing, means for rotating said helix positioned near the end thereof opposite said entering end, and a guide plate carried by said housing and adapted to support the portions of said form contiguous to the marginal portion passing through said housing.

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