Jan. 6, 1942. E. L. MUELLER 2,268,891

DRIVING MECHANISM FOR SHEETS OR BANDS

Filed April 8, 1939 2 Sheets-Sheet 1

FIG. 1

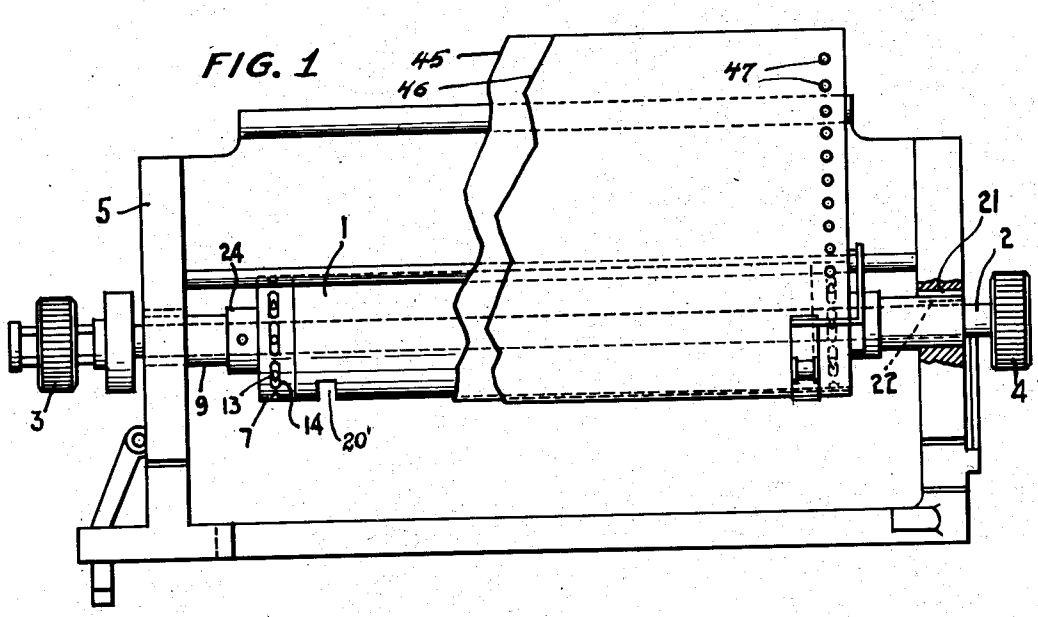


FIG. 2

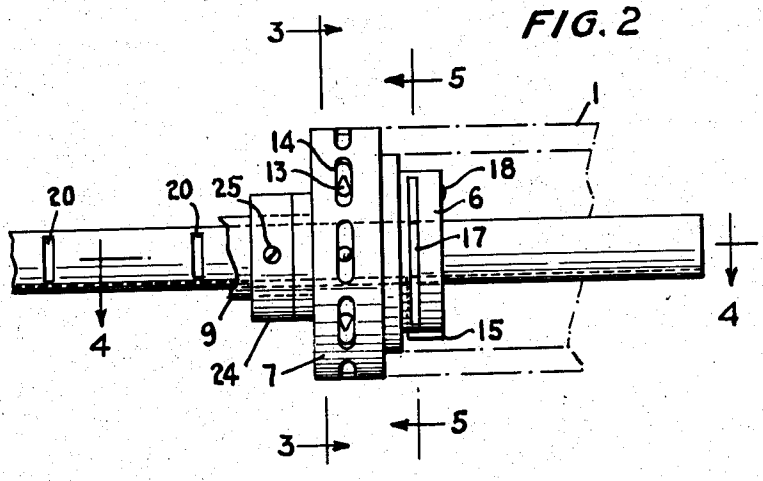


FIG. 3

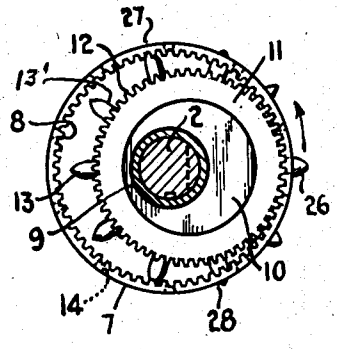


FIG. 4

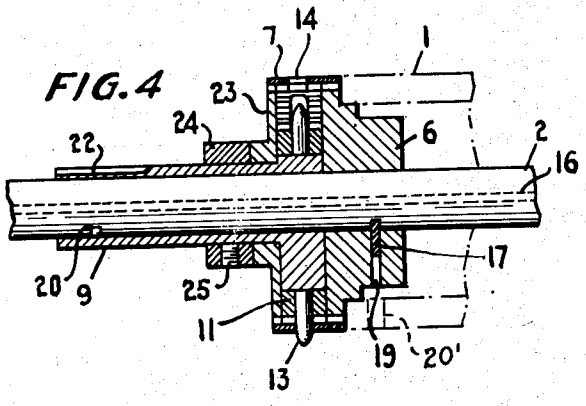
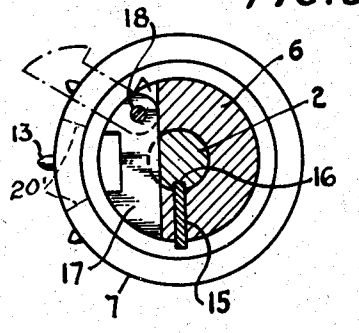


FIG. 5



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DRIVING MECHANISM FOR SHEETS OR BANDS

Filed April 8, 1939 2 Sheets-Sheet 2

FIG. 8

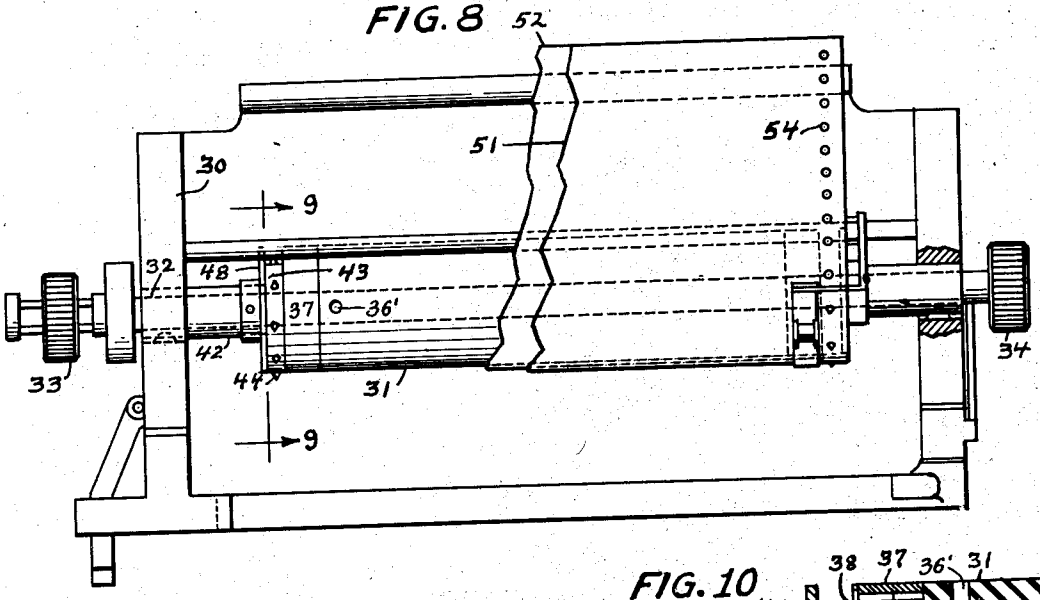


FIG. 10

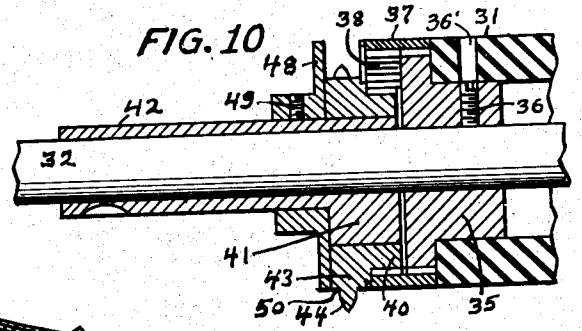


FIG. 9

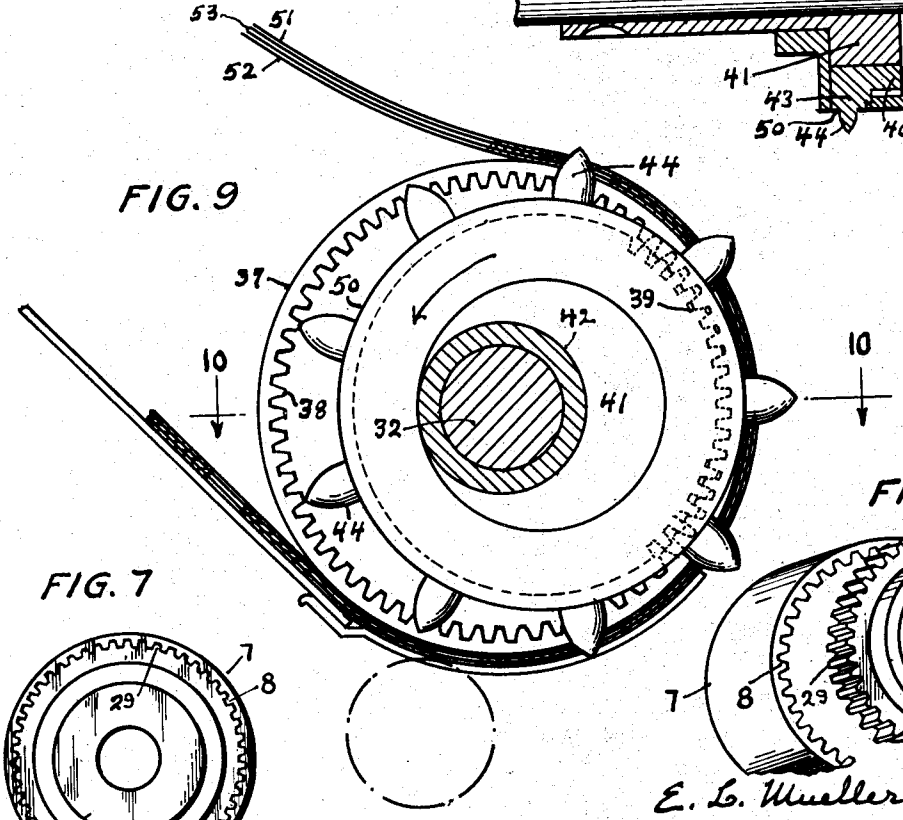


FIG. 7

FIG. 6

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2,268,891

DRIVING MECHANISM FOR SHEETS OR BANDS

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Application April 8, 1939, Serial No. 266,898

12 Claims. (Cl. 271—2.3)

This invention relates to means for driving sheets or bands through pins extending into the perforations in the sheets or bands. Such pin drives are useful where a positive, as distinguished from a frictional, driving of a sheet or band is required, as for instance the paper sheet printed upon in a typewriter or other printing mechanism and the films of moving picture machines, cameras, etc. While the invention is admirably adapted for the uses as stated, there are many other applications to which it is suitable and may be availed of wherever desirable.

The main object of the invention is to provide an improved, simple and efficient means of the character as indicated.

A further object of the invention is to provide apparatus of the character as indicated which shall provide the desired positive drive and at the same time accurately position the driven sheet or band.

A further object of the invention is to provide apparatus of the character described which shall insure positive, accurate, relative positioning of super-posed sheets, as for instance where carbon copies are made on a typewriter.

A further object of the invention is to provide apparatus of the character described in which the pins are of such construction that they will readily enter within the perforations of the sheets or bands and will accurately position the sheet or band where one sheet or band is employed and will accurately, relatively position superposed sheets or bands.

A further object of the invention is to provide compact and concealed gearing for the pin drive.

A further object of the invention is to provide a pin drive for a sheet or band, wherein the sheet or band about the perforations for the pins will not be marred or injured nor the driven sheet or band distorted or injured in any way.

A further object of the invention is to provide a device of the character described in which an internal gear is driven from the driving shaft and by such internal gear is driven a gear wheel which is eccentrically mounted with relation to said shaft and drives a similarly eccentrically mounted circular series of driving pins.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention—

Fig. 1 is a top plan view of a typewriter platen mounted in a typewriter carriage, which structure embodies the invention, certain of the usual appurtenances being omitted for the sake of clearness and some of the parts being broken away to show an interior section;

Fig. 2 is a side elevation, on an enlarged scale, of one end of the platen and shaft therefor having the invention applied thereto;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a section on the line 4—4 of Fig. 2;

Fig. 5 is a section on the line 5—5 of Fig. 2;

Fig. 6 is an exploded, perspective view, of the dis-assembled parts of the internal gear and mounting therefor constituting a part of the improved pin drive;

Fig. 7 is an end view of such parts assembled, being an end view, looking from the right of Fig. 4 with the platen and platen shaft removed;

Fig. 8 is a top plan view, similar to Fig. 1, of a typewriter carriage having a platen and a modified form of pin driving means embodying the invention;

Fig. 9 is a section, on an enlarged scale, on the line 9—9 of Fig. 8; and

Fig. 10 is a section, on a reduced scale, on the line 10—10 of Fig. 9.

Referring to the drawings and first to Figs. 1 to 7 inclusive, a typewriter platen 1 is fixed upon the shaft 2 which is rotatable in the usual manner by knurled finger wheels 3 and 4 upon the ends of the shaft, this platen being carried by the usual typewriter carriage frame 5. Also the usual paper-holding clips, line-spacing mechanism and other well-known appurtenances will be understood to be present so far as desired.

While, in the usual typewriter, the paper is driven forward by friction on the platen as the latter is turned. In the present structure the paper is perforated along its margins and is positively engaged by pins so that no slippage of the paper, and particularly slippage of one sheet of paper with relation to another where a plurality of sheets are operated upon as is the case where several copies are being simultaneously made by the process of inserting carbon sheets between the paper sheets to be written upon.

The driving means for the paper, as referred to, is the same at each end of the platen (at each side of the sheet) and the construction will therefore be described with relation to one end only.

The end head 6 of the platen 1 is secured to a ring 7 upon the internal surface of which are formed the gear teeth 8 whereby an internal gear is formed. Rotatably mounted upon the shaft 2 is a sleeve 9 having at one end the boss 10 which has a circular periphery but its center is eccentric to the center of the shaft 2. Rotatably mounted

about the boss 10 and having a running fit therewith is the ring 11 having the gear teeth 12 on its outer periphery adapted to mesh with the gear teeth 8 upon the interior of the ring 7. It will be seen that the ring 11 is of smaller over-all diameter than the interior diameter of the ring 7 and that its gear teeth mesh only with the gear teeth 8 of that side of the ring 7 with which they are held in engagement by reason of the eccentricity of the hub or boss 10 upon which the ring 11 is mounted. This, it will be seen, leaves a clearance between the opposite side of the ring 11 and the interior of the ring 7.

Projecting from the outer periphery of the ring 11 and intermediate the ends of the gear teeth 12 is the series of equi-distant pins 13, which pins are successively thrust outwardly through slots 14 in the ring 7 as the gear ring 11 is turned by the rotation of the internally-toothed ring 7. Each pin of the series is projected beyond the ring 7 to the greatest distance when it is at the greatest distance from the center of the shaft 2 and in line with the centres of the rings 7 and 11, and as the ring 11 is turned by the rotation of the ring 7, the pin is gradually retracted inwardly so that its tip soon disappears within the outer surface of the ring 7 and passes on within the same through the clearance between the rings 7 and 11 until it again emerges through a slot in the ring 7 and gradually projects more and more therefrom, as the gears turn, until it has again reached its position of maximum extension beyond the outer surface of the ring 7.

The pins of the series succeed each other in emerging from the outer rim of the ring 7 and each gradually increases its extension outside thereof until a maximum extension has been reached and then gradually the extension of the pin is reduced from its maximum until it disappears within the outer surface of the ring 7.

The shaft 2 and sleeve 9 are relatively rotatable, but the head 6 and shaft 2 are secured against relative rotation by means of a key 15 which may slide in a key-way 16 in the shaft 2 so that the head 6 and its related parts may be moved endwise on the shaft to accommodate different lengths of platen, this head structure being held in various positions for different lengths of platen respectively by the latch 17 pivoted at 18 in a slot 19 in the head 6 and adapted to be moved about its pivot to engage with one of a series of longitudinally displaced transverse slots 20 in the shaft 2. As any mechanic would understand, the slot 20' may be provided in the platen through which an instrument may be inserted to operate the latch 17 when the parts are assembled.

The radius on which the greatest extension of pin occurs can be located at any angular position about the axis of the shaft 2 by rotating the sleeve 9 and eccentric bearing 10 about the shaft 2 and, the desired angular position (usually at the printing line) having been arrived at, the sleeve and eccentric bearing may be fixed in angular position by keying the sleeve 9 to the side of the frame 5, within which it extends, by inserting a key 21 into an appropriately placed key-way 22 in the frame and a corresponding key-way 22' in the sleeve. It may be desirable to have the sleeve and eccentric bearing readily adjustable by turning about the shaft 2 whereby the position of the greatest pin extension may be adjusted about the axis of the shaft 2 as desired. This may be accomplished by omitting the key 21 so that the sleeve 9 is free to turn in the frame and providing a radial arm fixed to the sleeve by which the sleeve may be turned, with provision for securing the arm in any desired position of adjustment by releasably securing it to the frame.

A plate 23 closes one side of the internal gear, such plate having teeth cut upon its circumference which enter easily into the teeth 8 upon the interior of the ring 7. This plate is so adjusted that the eccentric mounting 10 is snugly fitted between the plate 23 and head 6, while the gear ring 11 has a running fit between such head and plate. The plate 23 is held in its position by means of a collar 24 abutting against the hub of the plate 23 and fixed to the sleeve 9 by a set-screw 25, the plate 23 being rotatable about the sleeve 9.

The paper or band to be driven passing in contact with the circumference of the ring 7 and being perforated with the perforations spaced to register with the pins 13, each of the pins will enter a perforation as the pin passes outwardly from the surface of the ring 7 and will be withdrawn therefrom as the pin moves inwardly. The outward and inward movement of each pin, as referred to, is occasioned by the difference in curvature of the ring 7 and the ring 11. As the two curves converge towards coincidence, the pin will be forced outwardly with relation to the ring 7 until the greatest extension of the pin is reached at the central position of tangency of the two curves. From this point the curves will diverge, the pin being drawn inwardly as the divergence increases. For example, referring to Fig. 3, with the rings 7 and 11 rotating in the direction as indicated by the arrow, the point of maximum extension of the pin is at 26 when, proceeding therefrom in the direction of the arrow, the curvatures of the ring 7 and 11 diverge and the pin is drawn gradually inward until it disappears within the ring 7 at approximately the position 27. The turning gear 11 will then carry the pin within the ring 7 until the curvatures of the rings 7 and 11 converging, the pin will begin to emerge from the outer surface of the ring 7 at approximately the point 28 and then, as the rings continue their turning and their curvatures converge, the pin will extend more and more outside the ring 7 until the position 26 of its maximum extension is reached and upon further turning of the rings, the diverging curvatures of the rings 7 and 11 will cause the inward retraction of the pin as before referred to, the pins succeeding each other in this cycle of operation.

As a pin is withdrawn from the perforation in the driven shaft or band, the outer surface of the ring 7 will act as a stripper to strip off the paper from the pin and thus prevent distortion or tearing of the paper by the failure of the paper to detach itself from the pin at the proper time as would often be the case if an ordinary sprocket wheel were employed.

Also it will be observed that the external surface of the ring 7 being of substantially the same diameter and therefore substantially flush with the surface of the platen, these surfaces will travel at the same linear speed and the ring 11 carrying the pins is positively connected with the ring 7 by the intermeshing gear teeth, so that the linear speed of the two rings about their respective centres is the same and therefore the pins move about the centre of ring 11 at the same linear speed as the ring 7. The linear

speed of a pin at its position of maximum extension will be the same as the linear speed of the rim or outside surface of the ring 7, but on account of the divergence of curvature of the series of pins and of the ring 7, the resultant component of speed of the pin along the path of the paper will vary considerably at other points. However, the divergence in curvature as referred to, is so small for a considerable distance on both sides of the position of maximum pin extension that there is no material difference in speed between the portion of the pin projecting outside the surface of the ring 7 and the speed of such surface, and each pin is caused to appear outside the outer surface of ring 7 within this range where there is no material difference between the speed of the pin and the speed of the outer surface of ring 7 as referred to. The result is that the drive of the paper by the pins will not tend to cause any slippage of the paper on the platen as would be the case if the platen surface and the pins driving the paper moved at substantially different speeds.

The linear speeds of the circumferences of the rings 7 and 11 being equal, the ring 11 will move at an angular velocity greater than the angular velocity of the ring 7. Care must therefore be taken that this difference in angular velocities of the two rings shall not cause the pins to become out of register with the perforations in the paper. It will be apparent that due to these different angular velocities a pin in one angular position with relation to the ring 7 (and therefore in relation to the paper perforations) will not, after a revolution, be in such relation. It will, at the end of the revolution, have moved forward beyond such relationship and unless proper arrangement has been made to take care of this discrepancy, the pins will not be in proper relation to the ring 7 and to the perforations in the driven sheet or band. To correct this discrepency, so that the pins will properly co-operate with the ring 7 and the paper perforations, the relationship between the pins and the gear rings 7 and 11 should be made such that the excess of movement of a pin over one revolution which takes place during one revolution of the ring 7, should be a multiple of the distance between two successive pins. The result is that any given pin at the end of a revolution of the ring 7 will be moved beyond the position which it occupied at the beginning of the revolution of the ring 7, by a distance which is a multiple of the distance between two successive pins. A succeeding pin will thus occupy the former position of the pin under consideration, and the pins will properly cooperate with the ring 7 and the perforations in the paper, the pins registering with the perforations and being merely moved forward by one or more pin spaces which still permits the pins to register properly. For example the internal gear teeth on the gear 7 are seventy-seven in number, whereas the teeth on the gear 11 are seventy in number. It thus appears that for one revolution of the ring 7, the gear 11 will make a complete revolution and seven teeth more. The number of pins being ten and the distance between the two adjacent pins being seven teeth, it will be apparent that at the end of one revolution of the ring 7 the pin next adjacent and behind the pin in question will occupy the relative position of the pin in question at the beginning of the revolution, and the pins will be in proper relation to the ring 7 and in registry with the perforations in the driven sheet or band.

Each of the pins 13 has a cylindrical portion 13' adjacent its base which will extend beyond the outer surface of the ring 7 when the pin is in proximity to the position of maximum extension. This cylindrical portion thus extending into a perforation in the paper provides a substantially right-angled abutment to the perforation edge or edges of the paper, thereby securely holding the paper in position and, where several super-posed sheets are employed, as where carbon copies are made as referred to, the edges of the super-posed perforations in the various sheets will be properly lined up so that the proper relative positions of the sheets will be secured. At the outer end of each pin, beyond the cylindrical portion as referred to, the pin is of tapered formation to insure that there will be no interference by the pin as it is extended through a slot 14 in the ring 7 and into a perforation, either with the ring or with the paper of the perforation.

The ring 7 and hub 6 which are fixed together in the completed device, are preferably, however, manufactured in two pieces and secured together. It is desirable that the teeth 8 should be cut on the interior of the ring 7 when it is just a plain ring and before being assembled with the part 6. This is for the reason that the tooth-cutting tool can then pass entirely through the ring, the teeth being cut entirely across it, whereby the tooth cutting operation is facilitated and there is no space upon the ring wasted.

Upon the hub 6 are cut the teeth 29 which are made slightly larger than the spaces between the teeth 8 so that the teeth 29 will not enter in such spaces except upon the application of force. The hub 6 and ring 7 are then forced together whereby the teeth 29 enter between the teeth 8 and are securely and firmly held. The hub 6 may be formed of brass, while the ring 7 may be of steel.

It will now be apparent that paper sheets 45 and 46 to be written on having suitably spaced perforations 47 along each marginal edge, may be superposed, one on the other with the perforations in register and a carbon sheet between in the usual manner for making carbon copies.

The sheets as so arranged may then be placed in the typewriter about the platen in the usual way so that the extended driving pins at each side enter within perforations along the margins. Writing may then take place as usual, and upon occasion arriving for shifting the paper to line space, the shaft 2 may be turned by the usual line spacing lever or by means of the pieces 3 or 4 when the pin drive will operate upon the perforated margins of the sheets to drive and hold the same in a manner as indicated, and this without relative disarrangement of the sheets (which on the contrary are held securely in proper relative position by the pins) and without injury to the paper about the perforations and without distortion or tearing of any of the sheets. Of course the sheets may be shifted in like manner to any desired degree, either greater or less than a line space.

Referring now to Figs. 8 to 10 inclusive, there is shown a modified form of pin drive. As in Figs. 1 to 7 inclusive, the apparatus comprises a typewriter carriage frame 30 in which is rotatably mounted the usual paper platen 31. The platen is fixed upon the shaft 32 rotatable in the usual manner by finger wheels 33 and 34. As in the earlier figures referred to, it is to be understood that the usual paper-holding clips, line

spacing mechanism and other well-known appurtenances will be present so far as desired.

The end head and pin drive for the paper are the same at each end of the platen, hence a description of one will apply to each.

At the end of the platen is a hub 35 which is secured to the shaft 32 by a set-screw 36 and to which is fixed the internal gear ring 37 in a manner as described in connection with the parts 6 and 7 forming a part of the structure of Figs. 1 to 7, the external surface of the ring 37 being flush with the platen surface. As will be apparent, a hole 36' may be provided in the platen through which a screw-driver may be inserted to set or unscrew the set screw 36 when the parts are assembled.

Upon the interior of the ring 37 are cut seventy-seven gear teeth 38 with which are adapted to mesh sixty-three gear teeth 39 cut on the circumference of the ring 40 mounted to rotate about an axis eccentric to that of the shaft 32 by means of an eccentric boss or bearing 41 secured to the sleeve 42 which extends within the side of the frame 30.

Fixed to the gear ring 40, and in this case integrally formed therewith, is the ring 43 also rotating on the eccentric boss 41 and having the nine equi-distant paper driving pins 44 projecting radially from it. The periphery of the ring 43 is flush with the surface of the platen on the side where the meshing of the gears takes place, and adjacent pins 44 are separated by the space of seven gear teeth. The maximum outer extension of a pin is at the central point of the length over which the teeth 39 and 38 intermesh, and this may be shifted to any desired point angularly of the shaft 32 by turning the sleeve 42. The most desirable point for maximum extension of the pins having been selected and the parts correspondingly adjusted, the sleeve 42 and its eccentric-bearing boss 41 may be fixed in position by keying to the frame 30 or the key may be omitted and the sleeve 42 and bearing boss 41 be made readily adjustable about the shaft 32 in a manner as described in connection with the structure of Figs. 1 to 7 inclusive.

The gear 40, it will be observed, is within and surrounded by the internal gear 38, while the series of driving pins 44 is laterally outside of such internal gear. The movement of the integrally-formed structure comprising the gear ring 40 and the pin ring 43 is limited in its movement to the left (see Fig. 10) by means of the plate 48 having a circular circumference and of substantially the same diameter as the gear ring 37, and fixed to the sleeve 42 by means of a set-screw 49.

The pin ring 43 and the gear ring 40 are concentric and the pin ring is of such diameter that the outermost portion of its circumferential face 50 is flush with the outer face of the ring 37 and the outer circumferential face of the plate 48. Each of the pins 44 has a cylindrical portion adjacent its base and a tapered portion outside the cylindrical portion for purposes as explained in connection with the structure of Figs. 1 to 7.

As the shaft 32 is rotated by means of the finger piece 33 or 34, the internal gear ring 37 will be rotated therewith and the gear 37 and series of pins 44 will be rotated about their eccentric axis and, as the pins rotate the pins will be successively extended to the greatest radial extent from the axis of the shaft 32 as they reach the position at which the circumferential face of the pin ring is flush with the outer surface of the plate 48 and the internal gear ring 37. As it moves into its position each pin will be gradually extended more and more outside the surface of the ring 37 until it reaches the position of maximum extension and then will, as the gears turn, be gradually withdrawn within such surface, as will appear especially from an inspection of Fig. 9 wherein the parts rotate in the direction of the arrow.

Paper sheets 51 and 52 with the usual carbon sheet 53 between them for making a carbon copy, are placed about the platen in the usual way, each of the sheets having a row of perforations 54 at each of its lateral margins, such perforations being adapted to register with the pins 44 in a manner as clearly indicated in Fig. 9. The position of maximum extension of the pins is preferably at the printing point so that the sheets are securely held in proper relative position at that point and the sheets are driven in one direction or the other by turning the shaft 32 by means of the finger piece 33 or 34, the pins successively engaging in the sheets and providing a positive drive for the sheets whereby they are held in proper relative position.

While the invention has been illustrated in what are considered its best applications it may have other embodiments without departing from its spirit and is not therefore limited to the structures shown in the drawings.

What I claim is:

1. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said internal gear and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said eccentric and shaft and a series of driving pins in driving relation to said gear of less diameter.

2. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said eccentric and shaft and a series of driving pins in fixed elation to said gear of less diameter.

3. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said ec-

centric and shaft and a series of driving pins in driving relation to said gear of less diameter, said pins being radially extended and retracted into and out of operative position as said gears are rotated.

4. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said eccentric and shaft and a series of driving pins in driving relation to said gear of less diameter, said pins being extended outside of and withdrawn within the outer surface of said internal gear.

5. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said eccentric and shaft and a series of driving pins in driving relation to said gear of less diameter, said pins being between the sides of said internal gear and said internal gear having openings through which said pins move.

6. A pin driving mechanism comprising in combination an internal gear having internal gear teeth, a rotatably mounted shaft to which said gear is fixed, said shaft being concentric with and extending through said gear, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth said means comprising an eccentric rotatably mounted on said shaft, and said gear of less diameter surrounding said eccentric and shaft and a series of driving pins in driving relation to said gear of less diameter, said pins being intermediate the ends of the teeth upon the gear of lesser diameter and said internal gear having openings through which said pins move.

7. A pin driving mechanism comprising in combination a rotatably mounted internal gear having internal gear teeth, a gear of less diameter than said ring and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth and a series of driving pins in driving relation to said gear of less diameter, said pins being located outside the lateral sides of said internal gear.

8. A pin driving mechanism comprising in combination a rotatably mounted internal gear having internal gear teeth, a gear of less diameter than said internal gear and having gear teeth upon its outer periphery, means for rotatably mounting said gear of less diameter upon an axis eccentric to the axis of said internal gear and with its teeth in mesh with said internal gear teeth and a series of driving pins in driving relation to said gear of less diameter, said pins being located outside the lateral sides of said internal gear and a plate of substantially the same diameter as the outer surface of said internal gear, said plate being on the opposite side of said pins from said internal gear.

9. A pin driving mechanism comprising in combination a rotatable shaft, an internal gear, a support for said internal gear fixed to said shaft and said internal gear, a gear of less diameter than said internal gear and meshing with the same, means for rotatably mounting the said gear of less diameter upon an axis eccentric to the axis of said shaft, a circular series of equi-distantly spaced pins mounted to rotate about said eccentric axis, said gear of less diameter being drivingly connected with said pins, said pins being extended outside of and withdrawn within the outer surface of said internal gear as said gears are rotated each of said pins being cylindrical adjacent its base and tapered at its outer end.

10. A pin driving mechanism comprising in combination a rotatable shaft, an internal gear, a support for said internal gear, fixed to said shaft and said internal gear, a gear of less diameter than said internal gear and meshing with the same, means for rotatably mounting the said gear of less diameter upon an axis eccentric to the axis of said shaft, a circular series of equi-distantly spaced pins mounted to rotate about said eccentric axis, said gear of less diameter being drivingly connected with said pins, said pins being extended outside of and withdrawn within the outer surface of said internal gear as said gears are rotated, said internal gear having openings through which said pins move and said pins being cylindrical adjacent its base and tapered at its outer end.

11. A pin driving mechanism comprising in combination a rotatable shaft, an internal gear fixed to said shaft, a sleeve about said shaft in which said shaft is rotatable, an eccentric bearing boss fixed upon said sleeve, a gear of less diameter than said internal gear rotatably mounted on said bearing boss and meshing with the teeth of said internal gear, a circular series of equi-distantly spaced pins also rotatably mounted upon said eccentric bearing, said series of pins being connected in driving relation to said gear of less diameter and said pins being successively moved into and out of operating position as said gears are turned.

12. A pin driving mechanism comprising in combination a rotatable shaft, an internal gear, a support for said internal gear fixed to said shaft and said internal gear, a gear of less diameter than said internal gear and meshing with the same, means for rotatably mounting the said gear of less diameter upon an axis eccentric to the axis of said shaft, a circular series of equi-distantly spaced pins mounted to rotate about said eccentric axis, said gear of less diameter being drivingly connected with said pins, said pins being extended outside of and withdrawn within the outer surface of said internal gear as said gears are rotated, said series of pins being laterally outside said internal gear.

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