Aug. 7, 1934. L. H. MORSE 1,968,848

PRINTING MACHINE

Filed July 7, 1930 2 Sheets-Sheet 1

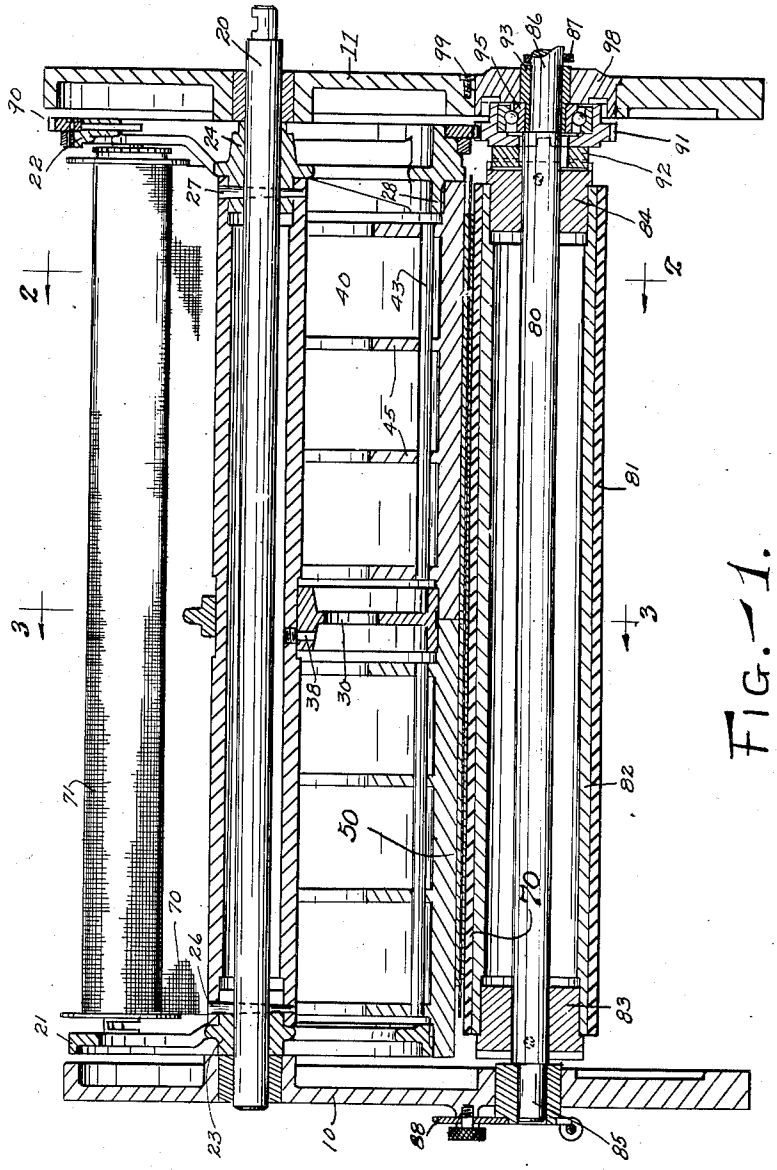



FIG. 1.

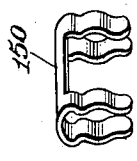



FIG. 2.

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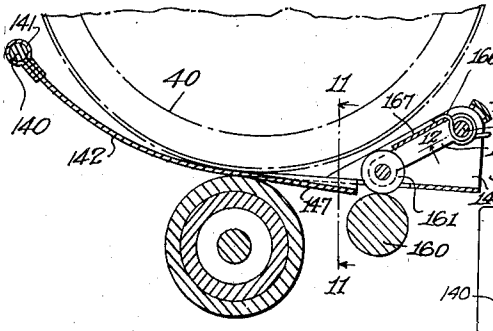



FIG. 4.

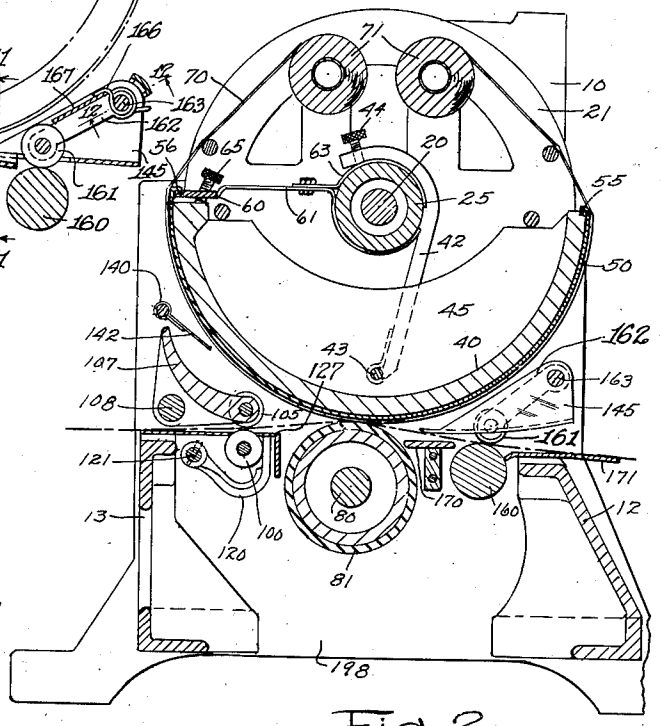



FIG. 2.

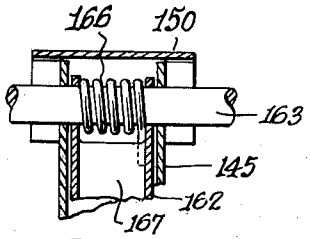



FIG. 6.

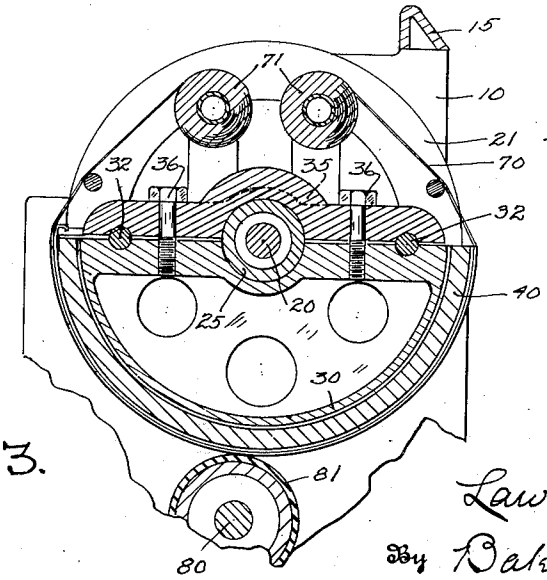



FIG. 3.

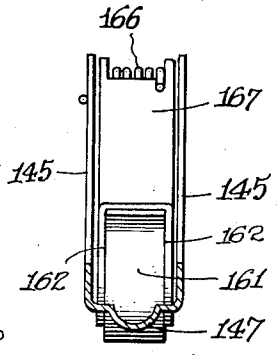



FIG. 5.

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Patented Aug. 7, 1934 1,968,848

# UNITED STATES PATENT OFFICE

1,968,848

## PRINTING MACHINE

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Application July 7, 1930, Serial No. 466,000

12 Claims. (Cl. 101—375)

This invention relates to a rotary printing machine of a general type known as the Multigraph, comprising a rotary drum adapted to carry a printing form and a rotary platen with which the drum coacts. The form may be inked in any suitable manner, as for instance by means of a ribbon extending over the form and having its ends carried by spools mounted in the drum.

One of the objects of the present invention is to lengthen the drum without causing undue bending stress on the drum supporting shaft. More particularly my invention doubles the length of the drum by employing two of the standard multigraph printing segments mounted end to end, and the invention includes the means for carrying and operating such segments.

The particular means shown for supporting the inner end of the two segments, which is comprised within my invention, consists of a tubular shaft surrounding the drum-shaft within the drum and intermediately spaced from that shaft, and a saddle mounted on the mid-region of such tubular shaft and engaging the segments.

The features above referred to, as well as various minor items contributing to the efficiency of the machine, will be apparent from the description hereinafter given of the preferred embodiment shown in the drawings.

In the drawings Fig. 1 is a vertical section of the machine in an offset plane passing through the main shaft and the platen shaft; Figs. 2 and 3 are vertical transverse sections on the lines 2—2 and 3—3 on Fig. 1; Fig. 4 is an enlarged vertical section through the machine showing especially the paper stripping and ejecting mechanism; Figs. 5 and 6 are sectional details of the ejecting mechanism; Fig. 7 is a perspective of a device for locating the ejecting strips on their carrying rods.

The frame of my machine comprises a pair of upright end plates 10 and 11 and longitudinal members 12 and 13 between the lower portions of the end plates to constitute a suitable base portion. Journalled in the end members is a shaft 20 carrying the printing drum; a shaft 80 carrying the platen, and a shaft 180 comprising the main shaft of the power drum. The frame plates also carry longitudinal rods and shafts for the paper feed at the front of the pass of the drum and platen, and a rod carrying the ejecting rolls at the rear of such pass.

Referring first to the printing drum, 21 and 22 indicate a pair of skeleton discs or wheels having hubs 23 and 24 which surround the shaft 20. These hubs have cylindrical portions projecting toward each other, and mounted on these portions is a sleeve 25. The sleeve, discs and shaft are all rigidly secured together by pins 26 and 27 passing through them. Secured to the intermediate region of the sleeve, that is to say in the mid region shown, is the segmental saddle 30. As shown, this saddle seats against the sleeve and also against a pair of diametrically positioned rods 32 carried by the discs 21 and 22. The saddle is clamped in place by means of a keeper 35 suitably recessed to engage the other side of the sleeve 25 and rods 32, and suitable cap screws 36 passing through the keeper into the segment. A suitable pin 38, projecting radially from the sleeve occupies a corresponding opening in the saddle and insures against longitudinal shifting thereof. The saddle 30 is of the same radius as the end disc 21, and as an arcuate ledge 28 on the end disc 22. Accordingly, this ledge, the saddle and the other end disc present partially cylindrical surfaces on which the printing segments may rest in registration with each other.

40 and 41 indicate a pair of segments of a standard Multigraph machine. In that machine, but one of these segments is employed resting upon two rotary end discs of the drum, while the present machine employs two of these same segments, each of which rests at its outer end on one of the end discs, and at its inner end on the saddle 30 carried by the sleeve 25. These segments are held in place by means of hooks 42 which are pivotally anchored by rods 43 mounted longitudinally in the segments, the end portion of the hook passing about the sleeve 25, and being clamped thereto by a set screw 44 mounted in the hook. These hooks are omitted from Fig. 2 for clearness of illustration. There is preferably one hook for each segment located in the mid region of the segment between the two intermediate webs 45 thereof.

It will be seen that by employing the tubular construction carrying the central segmental saddle 30, I am enabled to support the two segments 40 and 41 in accurate surface registration, and without subjecting the shaft 20 to a bending stress. The sleeve 25 being completely tubular and of considerable diameter, is stiff enough to resist bending stress, but in any event the clearance between the sleeve and the shaft prevents any such stress being transmitted to the intermediate region of the shaft and thus there is merely a sheering stress on the shaft adjacent the bearings thereof.

While I have shown in the drawings but two segments mounted end to end, the same girder

system of support will enable the mounting of more than two, if greater length of the printing machine should be desired.

I have illustrated the printing form as made up by a pair of blankets 50, mounted on the respective segments, and each carrying a number of printing strips 52. These blankets may be made in accordance with Patents Nos. 1,438,580, 1,438,582 and 1,438,584 of my assignee, The American Multigraph Company, such blankets providing rows of upstanding overhanging projections, and in such case the printing members may be embossed strips having inwardly curled edge flanges as shown and claimed in Patent No. 1,557,754 of The American Multigraph Company.

In any case, the blanket is suitably anchored to one edge of the corresponding segment and lies snugly about the curved surface of the segment, the other edge of the blanket being drawn by suitable mechanism to maintain the blanket taut. As shown particularly in Fig. 2, the edge 55 of the blanket is hooked into the edge of the segment, while the other edge 56 of the blanket is hooked onto a movable bar 60, which is carried by arms 61 embracing the sleeve 25. There may conveniently be two of these arms 60 for each bar. The inner portion of the arm shown is bent to lie about a portion of the sleeve 25, and secured to the arm is an oppositely curved keeper 63 engaging the other side of the sleeve. Set screws 65 passing through the bar 60 are adapted to engage the edge of the segment and thus maintain the blanket taut.

Any desired means may be employed for inking the form. I have shown an inked ribbon 70 extending about the form and having its ends wound up on spools 71, carried within the drum; that is to say, the spools are carried by the end members 21 and 22 of the drum in suitable manner to enable the removal of the spools whenever desired. Suitable mechanism is also provided to feed one or the other spool periodically during the rotation to present a fresh portion to the type characters, such spool-carrying and feeding mechanisms may well be made in accordance with Patent No. 997,287 of The American Multigraph Company.

I have shown two separate blankets mounted on the two segments 40, but as these segments closely abut each other at their inner ends it is entirely feasible to mount on them, if desired, a single blanket which lies on both segments. In any event, my construction provides a comparatively long printing form carried on a rotary drum, which is at once firm and stiff and at the same time of very light construction.

In the particular embodiment shown, the form coacts with a single continuous platen 81 located beneath it, this platen being carried by shaft 80 hereinbefore referred to. The platen as shown, comprises a rubber or other yielding surface, mounted on a metal sleeve carried by cylindrical blocks 83 and 84, pinned to the shaft 80. This shaft has eccentric extensions 85 and 86, and a suitable lever 87 secured to the extension 86, enables the shaft to be turned to swing the platen down to idle position whenever desired.

The platen is suitably geared with the printing drum. To this end, I may mount a gear 90 on the drum which meshes with a gear 91 carried concentrically of the shaft extension 86, and I may provide a suitable shiftable coupling (preferably an Oldham coupling) 92 between the pinion 91 and the end member 84 of the platen. As shown in Fig. 2, the pinion 91 bears on a bushing 93 which surrounds the shaft extension 86, the bushing carrying the inner race of a ball bearing 95, the outer race of which is seated within a recess in the pinion 91. The bushing 93 is mounted in a disc 98, somewhat larger than the platen in diameter, which is mounted in the frame plate 11, being held against rotation by screws 99. The removal of these screws enables the removal of the disc 98, together with the ball bearing, the pinion 91, the coupling 92, the platen and the platen shaft, all as a unit.

When the platen unit has been removed, the pins connecting one of the end blocks 83 with the shaft 80, may be driven out, and thus the platen sleeve 82 with its rubber surfacing removed. This enables the ready placing of a fresh platen sleeve, or the former sleeve may, if desired, be turned end for end and remounted on the shaft, the parts being then returned to position.

The left hand end of the platen shaft in Fig. 1 is shown as mounted in a bushing 93, which is mounted in the frame plate 10, and is adjustable by a suitable locking device 88. By turning this bushing, the platen shaft may be brought into absolute parallelism with the drum shaft, after which this bushing is locked permanently in place.

Any suitable paper feed mechanism may be employed. As indicated in Fig. 2, "100" designates a lower feed roll and "105" a cooperating upper feed roll, the latter being carried by a yoke 107, pivoted at 108. Suitable stop fingers 120 on a rock shaft 121 (shown in their lowered position) may operate in the usual manner to control the time of beginning the feeding movement.

In front of the printing drum is a shaft 140 on which is slidably mounted the looped front ends 141 of a pair of thin spring metal straps 142. These straps are located adjacent the opposite ends of the sheet and beyond the printing form proper. Each strap extends between the drum and the platen, and lies over the paper and is adapted to prevent the forward edge of the paper curling up against the drum, and to insure it going into the pass of the drum and platen. The loops 141 of the metal straps embrace the rod 140 with sufficient freedom so that the straps may be shifted lengthwise as desired.

To hold the straps in selected position, I provide the spring clips 150, shown in Fig. 7. Each of these clips has two pairs of spring arms, adapted to embrace the rod 140 on opposite sides of the strap I with sufficient friction to prevent inadvertent displacement.

At the rear of the platen, I locate a long ejector roller 160. Above this roller are a plurality of short rolls 161 carried in trough-shaped metal arms 162 pivoted on a rod 163. The rear portion of the strap 142 is formed at its sides with a pair of upwardly extending flanges 145 which extend about the rod 163, whereby that end of the strap is supported. The arm 162 carrying the ejector roll 161 is thus housed between the strap flanges. The roll extends down through an opening made in the strap proper between the flanges, as shown in Fig. 4, and is pressed downwardly by a coiled spring 166 surrounding the rod 163 and bearing at its ends against the top portion 167 of the arm and the rear edge of one of the flanges 145.

Between the platen and the ejector roller 160, I mount a narrow paper table 170 (Fig. 2), and

at the rear of the roller 160, I supply a paper table 171, the forward edge of which substantially comes into contact with the roller 160 and insures stripping of the paper from that roller.

I find that I can insure the paper passing from the printing couple to the pass of the ejector rollers very efficiently by making a slight downward trough 147 in the strap 142 directly in front of the opening through which the roll 161 extends. This trough is located in the central region of the strap and merges with it adjacent the rear of the pass between the drum and platen and thence increases in depth gradually to a point a slight distance in front of the pass of the ejector rolls. I have found by experience that this particular form of inclined gradual downward projection is very effective in directing paper to the ejector rolls.

It is to be understood that the arm 162 carrying the rolls 161, as well as the flanges 145 of the ejector strap, are slidably mounted on the supporting rod 163. The flanges 145 and the roll arm 162 housed within them may be locked in position by the same kind of clips 150 (Fig. 7) as employed for locking the forward end of the strap 142 on the rod 140. Accordingly, both the rear end and the front end of this strap are simultaneously adjusted when it is desired to make a change for a different width of paper.

It will be seen that by my supporting tube and saddle I have effectively doubled the length of the standard Multigraph, while, by reason of the adjustability of the paper-holding strips and ejector mechanism, paper of any width may be used. Accordingly, it is possible to print with a form of any width up to twice the normal size, or two single pages may be printed side by side, if desired. Also, it should be noticed that this double width machine may be used exactly in the manner of a standard Multigraph, printing single sheets simply by a form mounted on only one segment. For such use, the wide ribbon shown may be used, the unemployed region being available for subsequent use by simply turning the ribbon around, or, in place of the wide ribbon shown in Fig. 1, I may employ standard width ribbon, shiftably mounted on a long rod, as illustrated in application No. 407,049, filed November 14th, 1929, by Henry C. Osborn, and assigned to my assignee, the Multigraph Company, which has matured into Patent No. 1,837,184, issued November 8, 1932.

I claim:

1. In a printing machine, the combination of a shaft, a pair of end members for a printing drum, carried by the shaft and spaced apart thereon, a sleeve of materially less diameter than the drum, said sleeve surrounding the shaft between the end members and connected with them, and an intermediate support mounted on the exterior of the sleeve, and a rigid segment spanning the open space between an end member and the support.

2. In a printing machine, the combination of a rotary shaft, end members thereon to provide a skeleton drum radially open to the exterior, a plurality of stiff printing segments extending across the drum opening, the outer ends of which are supported by the end members, and hollow means of substantially less extent in a radial direction than the radius of the segments, said hollow means being less flexible than the shaft and being rigidly connected to the shaft adjacent the end members, there being a support between said hollow means and the inner ends of the segments whereby the intermediate region of the shaft is not subjected to bending moment caused by the weight of the segments.

3. In a printing machine, the combination of a shaft, a pair of bearings therefor, a sleeve surrounding the shaft and rigid therewith and spaced from it, a plurality of segments, means for supporting the inner ends thereof from an intermediate region of the sleeve, means rigid with the shaft for supporting the outer ends of the segments independently of the sleeve, and means carried by the segments on their concave sides for bracing them in the regions where they are out of contact with their supports.

4. In a printing machine, the combination of a shaft, a pair of end members carried by the shaft and spaced apart thereon, a sleeve surrounding the shaft between the end members and rigidly connected with them, said sleeve having an external diameter materially less than the diameter of the end member, a support mounted on the exterior of the sleeve intermediate the end members, and a pair of segments, each braced by arcuate webs on its innerside, said segments resting at their outer ends on the end members respectively and at their inner ends on said intermediate support.

5. In a printing machine having centrifugally unbalanced printing members, the combination of a rotary shaft, a pair of bearings therefor, a substantially rigid sleeve surrounding the shaft and spaced from it, means rigidly connecting the end portions of the sleeve with the shaft adjacent the bearings, an intermediate external support mounted on said sleeve, a pair of end supports rigidly carried by the shaft adjacent the bearings and having arcuate peripheries of materially greater diameter than the sleeve, and a pair of aligned segments braced internally and each supported at its outer end by one of the end supports and at its inner end by said intermediate support, whereby the inner ends of the segments are supported in alignment with their outer ends without bending the shaft.

6. In a printing machine, the combination of a shaft, bearings therefor, drum-ends carried by the shaft adjacent the bearings, printing segments secured to the drum-ends, a member additional to the drum-ends and having a materially less diameter than the drum-ends and outside of the shaft, said member having its ends supported by the shaft adjacent the drum-ends and its intermediate region out of contact with the shaft, said intermediate region assisting in the support of the segments.

7. In a printing machine, the combination of a pair of frame members, a shaft journalled therein, a pair of end members for a drum mounted on the shaft between the frame members, said end members having hubs projecting toward each other, a sleeve rigidly mounted on said hubs on the inner sides of the end member and surrounding the shaft and spaced from it, a segmental saddle rigidly secured in intermediate position to the exterior of the sleeve, the saddle and each of the end members having arcuate surfaces concentric with the hubs, and a pair of aligned segments having their outer ends resting on the end members and their inner ends on said saddle.

8. In a printing machine, the combination of a shaft, a pair of members thereon adapted to support the outer end portions of a pair of rigid segments, a tube of greater internal diameter than the external diameter of the shaft and of materially less external diameter than the end

members surrounding the shaft and supported at its ends thereby, a saddle resting against one side of the exterior of the tube and having an arcute periphery adapted to engage and support the inner end portions of said pair of segments, and means for clamping the saddle on the tube.

9. In a printing machine, the combination of a shaft, a pair of end members for a printing drum, carried by the shaft and spaced apart thereon, a sleeve surrounding the shaft between the end members and connected with them, and an intermediate support mounted on the exterior of the sleeve, a pair of segments spanning the open spaces between the end members and intermediate support, and attaching devices secured to the inner side of the segments adapted to be removably engaged to the sleeve.

10. The combination, with a frame, of a rotary shaft journalled therein, a pair of end members rigidly mounted on the shaft and having arcuate peripheries, a tube having an internal diameter materially larger than the exernal diameter of the shaft and an external diameter materially smaller than that of the end members, said tube surrounding the shaft between the end members and having its ends rigidly supported by the shaft, a saddle having an arcuate periphery of substantially the same radius as that of the end members and having a transverse portion with a recess embracing a portion of the tube, means for clamping the saddle to the tube, and a pair of stiff segments carrying bracing means on their concave sides and mounted end to end and each having adjacent its ends arcuate seats resting at the inner end on the saddle and at their outer end on one of the end members.

11. In a printing machine, the combination of a shaft, a pair of end members mounted thereon, a tube of much smaller diameter than the end members, said tube surrounding the shaft intermediately spaced from it but supported at its ends by the shaft, a saddle on the exterior of an intermediate region of the tube, the end members and the saddle having arcuate outer peripheries of the same radius and a pair of rigid segments, each formed with stiffening webs on its inner periphery and having its end portions projecting longitudinally beyond the webs, said end portions having their inner peripheries of the same radius as the outer peripheries of the end members and saddle, said end portions of the segments at the outer edge overlapping and resting on the end members and at their inner ends overlapping and resting on the saddle.

12. The combination, with a frame, of a rotary shaft journaled therein, a pair of end members rigidly mounted on the shaft and having arcuate peripheries, a tube having an internal diameter materially larger than the external diameter of the shaft, said tube surrounding the shaft beween the end members and having its ends supported by the shaft by reason of extending over projecting hubs on the end members, a saddle having an arcuate periphery of substantially the same radius as that of the end members having a transverse portion with a recess occupied by a portion of the tube, a recessed clamping plate on the other side of the tube, bolts connecting the clamping plate to the saddle, and a pair of segments mounted end to end and each resting at its inner end on the saddle and at its outer end on one of the end members, each segment having means to engage the tube for holding the segment in place.

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