

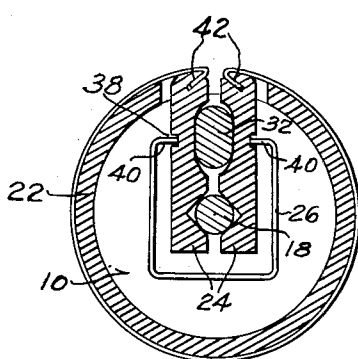
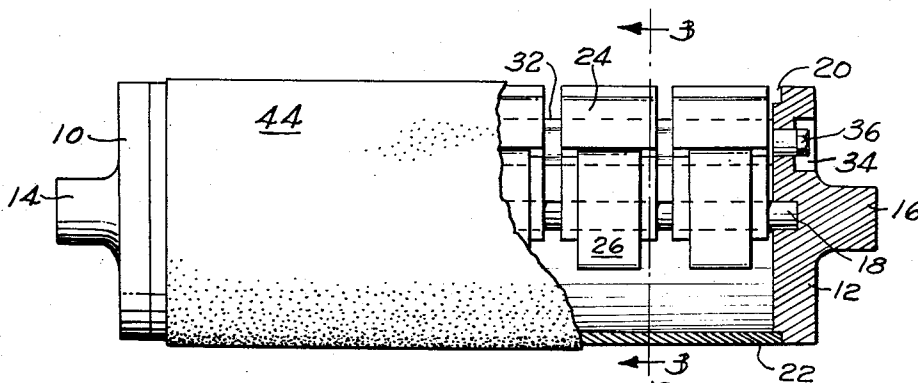
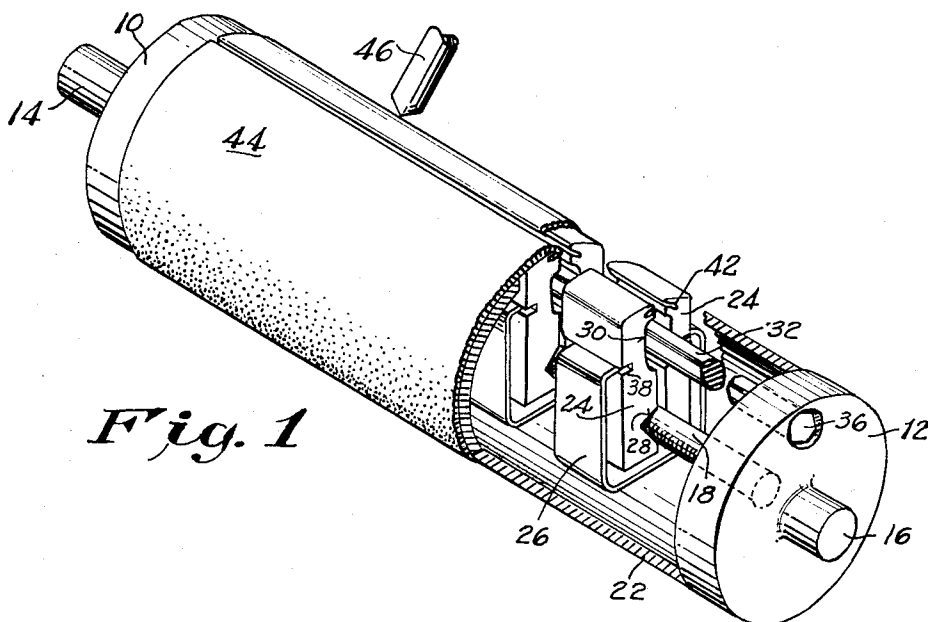
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SHEET CYLINDER FOR IMAGE REPRODUCING MACHINES

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SHEET CYLINDER FOR IMAGE REPRODUCING MACHINES

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This invention pertains to an improved cylindrical sheet clamping and stretching device, and particularly to such a device intended for holding a sheet of plastic, thin metal or other engravable material in cylindrical form. The invention is especially intended for use with facsimile or image engraving machines in which the final product is an engraved sheet suitable for use as a printing plate, matrix or the like. A photoelectrically controlled engraving apparatus for which the invention is particularly designed is well shown and described in the U.S. reissue patent to Boyajean, No. 23,914, and owned by the assignee of the present invention.

The problem solved by the present invention is complicated by the fact that suitable engravable materials, such as plastic sheets or even thin metal sheets, are considerably stiffer than the paper employed in purely photographic facsimile receivers. For hot stylus engraving, cellulose nitrate .020 inch thick is common. The stiffness makes it more difficult to ensure that the sheet will snugly embrace the carrying cylinder at all points, and continuously throughout the operation of engraving an entire sheet. Also, because of the small amount of "give" or local stretching which can be obtained with moderate tensions, it has been essential to maintain extremely close dimensional tolerances in the length of the sheet as measured in the peripheral direction about the supporting cylinder.

Common practice has been to provide the blank sheets in pre-cut form, with two opposite edges turned back at an acute angle and creased, so that the user merely inserts one of the turned-back margins into a slot in the cylinder, wraps the plastic tightly around, and inserts the other turned-back margin behind a movable clamping bar which is contained within the cylinder adjacent the slot. Movement of this bar enables the sheet to be pulled snugly around the cylinder. Since the clamping bar is in one piece lengthwise of the cylinder, this requires that the "length" of the sheet (in the direction of wrap-around) be accurately controlled and be extremely constant as measured at various points between the side edges of the sheet. Moreover, because the sheet is fixed at one end, the clamping bar must work against the friction of almost an entire turn of the sheet around the cylinder, requiring considerable force and tension especially in the region of the sheet nearest the clamp bar. Finally, any local inhomogeneities in the stiffness of the sheet or its resistance to tension, will produce different degrees of tightness along the length of the loaded cylinder.

The present invention overcomes these objections to a large degree, by providing a clamping arrangement which operates more or less independently upon successive different "belts" or annular areas of the plastic sheet distributed lengthwise of the cylinder, and in which movable clamping elements (relative to the cylinder body) are employed at both the ends of the sheet. These several clamping elements are urged to clamping positions by individual springs, and are released by a common manually-operated release element. Thus, unlike prior devices, the tension in the sheet can be accurately controlled at all points. At the same time, slight variations from standard in the length of the sheet in the peripheral direction do not interfere with the obtaining of a tight wrap,

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because they are accommodated by the tensioning springs above mentioned. Also, if the opposite ends of the sheet are slightly non-parallel, or there are other local variations in this lengthwise direction, the independent spring tensioning devices nevertheless maintain the proper tension at all points. Finally, the use of movable tensioning elements at both sheet ends permits a snug wrap with a moderate degree of tension, because the wrap in effect occurs in both directions away from a point on the cylinder 180° from the clamp elements; i.e., through only half a turn.

The manner in which the above principles are embodied in a preferred form of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view, partly broken away, of a complete cylinder sheet clamping arrangement.

FIG. 2 is a side elevation of the same parts, and

FIG. 3 is a vertical sectional view taken essentially on line 3—3 of FIG. 2.

As shown in the drawings, the sheet clamping and stretching device of the invention is generally cylindrical in form, having two circular end flanges 10 and 12, end flange 12 being shown in section in FIG. 2. Each of the end flanges 10 and 12 has an external and preferably integral stub shaft 14 and 16 respectively, for the purpose of supporting piloting, and rotating the whole cylinder in suitable bearings in the general arrangement of the Boyajean patent. Concentrically mounted to extend between the inner faces of end flanges 10 and 12 is a support shaft 18, which is fixed with respect to the end flanges 10 and 12 and may be set into them, the purpose of shaft 18 being to lend rigidity to the whole cylinder and to support internal clamp mechanisms, which will shortly be described.

On each of the internal faces of end flanges 10 and 12 is a concentric circular shoulder 20 whose surfaces rigidly support, in any appropriate manner, the substantially cylindrical outer shell member 22 which is shown partly broken away. The ends of shell 22 may be welded or secured in the shoulders 20 by screws. Member 22 does not comprise a complete hollow cylinder; it is largely cylindrical but has a longitudinal gap or slot parallel to shaft 18 for the purpose of permitting access, between the longitudinal edges of the gap in member 22, to the clamping surfaces of pairs of clamping shoes 24, which are mounted on, and spaced along shaft 18 in sets, and which are held in position along shaft 18 by the tension of springs 26, which also tend to hold the members of each pair of clamping shoes 24 together. Bar 18 may also be shouldered to locate these sets. Each shoe of each pair of clamping shoes 24 is recessed, as exemplified by the V-groove or way at 28, to grip shaft 18 for slight rotational movement between each shoe and its opposite member. Each shoe of each pair or set is also recessed or cut away, as at 30, to permit each pair to pass between them the common control shaft 32, which shaft 32 is oblong, elliptical or of other non-circular cross-section for at least those parts of its length which lie between opposed clamp shoes 24.

Shaft 32 is supported for rotation between end flanges 10 and 12, and the ends of shaft 32 are so journaled in the flanges that the shaft 32 may be rotated at least one-quarter turn. The end of shaft 32 at one end of the cylinder passes into a recess 34 in end flange 12, and has a hexagonal or other suitable shape, as at 36, for the purpose of accommodating a socket wrench or the like, which is used as a handle for turning shaft 32 substantially 90 degrees from its position as shown in FIG. 1, or for returning shaft 32 to its indicated position.

Each shoe of each set of clamping shoes 24 is urged

toward the other by spring tension when control bar 32 is in the position shown. The short part 40 of spring 26 is held in a groove 38 in each shoe, thus insuring that each spring 26 and its pair of shoes 24 remain under tension and correctly positioned with respect to each other and to shafts 18 and 32.

The shoes forming each pair of shoes 24 have their facing edges appropriately slotted, as at 42, to receive in whole or in part an edge of one sheet of the prepared plastic engravable material 44 or other material, preferably having suitably formed flanges. The pairs of shoes 24 are all expanded by the lateral pressure of control shaft 32 when it has been turned so as to spread the shoes against the tension of springs 26; and the pairs of shoes 24, or certain of them, will hold the sheet of engravable or other material 44 in a smooth, substantially cylindrical contour for the application of the engraving needle or stylus 46 when all the springs 26 are released upon the return of shaft 32 to its non-spreading position as drawn.

FIGURE 3 is another view of the cylinder clamping and stretching device, in transverse section, along the plane 3—3 of FIGURE 2, showing in more detail the design and arrangement of certain parts, with like parts of all the figures being indicated by like numbers.

Coming now to the operation of the improved device, and referring first to FIGURE 1, the head of an hexagonal socket wrench or other instrumentality is inserted within recess 34 and over the adjusting head of the shaft 32. By rotating the wrench and hence the control shaft 32 substantially 90 degrees from its indicated position, the wider portion of shaft 32 will be brought to engage the surfaces of recesses 30, and transverse outward pressure will be transmitted to every pair of clamping shoes 24 simultaneously, spreading every pair of shoes apart at their upper portions as they pivot on shaft 18. Each spring 26 will of course still hold its pair of shoes 24 under tension to maintain its location in the assembly, but with the upper tips of the shoes separated.

A sheet of the prepared engravable material 44 or the like preferably having suitable flanges, is then wrapped about cylinder or member 22 by the operator, this material being of any desired width, and its flanged edges are inserted in the slots 42 adjacent the curved upper surfaces of the clamping shoes 24. By means of the wrench or handle the operator then restores shaft 32 to its indicated position, and the pressure exerted by springs 26 against every pair of clamp shoes 24 restores and holds the shoes substantially to their position as drawn, with the result that the sheet of engravable material or other material is itself brought under the transmitted tension of the appropriate number of pairs of clamp shoes 24, this tension or pressure being applied near the two inserted sheet edges simultaneously; hence about the periphery of cylinder shell or member 22. Obviously, depending on the number of shoe-spring sub-assemblies (24—26) disposed within the cylinder 22, an optimum "spread" or dispersion of tensioning forces over substantially the whole of the sheet material 44 will be quickly and easily obtained; and this desirable result is obtained largely independently of whether the sheet 44 is relatively wide or narrow, or of whether the edges of the sheet are accurately trimmed. This dispersion of tensioning forces results in a smoother and more truly cylindrical contour being easily and quickly brought about in an engraving sheet, even by a relatively unskilled operator; and as a final very desirable result, permits a considerable reduction or elimination of the "bounce" of the motor and mechanism which drive the stylus with obvious improvement in the quality of the finished engraving.

By referring to FIGURE 3, it will be observed that the upwardly extending ends, or gripper ends, of the shoes 24 extend into the slot of cylindrical body 22. The edges of the slot therefore act to limit the freedom of

the clamping devices for angular movement about shaft 18. Within these limits, the limited freedom of movement of the gripper ends permits the clamping device to position themselves to accommodate slight differences in the peripheral length of the sheet 44 at different points along the cylinder, as well as to accommodate minor local variations in the straightness of the sheet edges. Preferably, and as also clearly shown in FIGURE 3, the outer ends of the grippers are ground or otherwise shaped to conform to the cylindrical surface of the cylindrical body 22. This provides a maximum usable area of the sheet and facilitates wrapping the sheet about the cylinder and clamping it in place. The use of springs 26 urging the jaws together, rather than an arrangement in which the jaws are independently resiliently mounted with respect to shaft 18 or body 22, facilitates the self-aligning action of the clamping devices along the cylinder length. For the same reason, making the clamping jaws independent and locating them against opposite sides of the bars 18 and 32, rather than pivoting them directly to one another in a rigid fashion, contributes to the self-aligning feature.

Although a preferred embodiment of the invention has been described, it is obvious that modification may be made without departing from the spirit of the invention. For example, shaft 18 is not essential to the invention; for the shoes of each pair of shoes may be mutually hinged to one another and otherwise supported in position. In other words, a separate shaft or hinge may be provided for the mutual adjustment of each pair of shoes 24, and locating spacers may be provided between adjacent pairs of shoes, and between each flange and its adjacent pair of shoes 24, to insure proper spacing of the shoes along shaft 32 and within the cylinder.

Having thus described the invention, what is claimed is:

1. A sheet clamping and stretching mechanism for image reproducing machines or the like, comprising an elongated hollow cylinder having a lengthwise slot therein and a central axial shaft, and a plurality of sheet clamping and stretching devices within said cylinder and spaced lengthwise thereof; each of said devices comprising a pair of directly opposed sheet-gripping elements mounted for limited independent pivotal movement toward and away from one another about said shaft, and spring means individual to each device for urging the said elements of each pair towards one another at their outer ends; said outer ends of all said gripping elements terminating within said slot and being arcuately profiled to define a smooth continuation of the outer peripheral surface of said cylinder, and having an aggregate length in the direction of said slot which is a major portion of the entire length of said slot; the facing surfaces of said elements forming each said device being slotted in a direction parallel to said shaft but at opposite reversely acute inclinations with reference to the curvature of their outer ends, whereby to receive and engage with the reversely-bent opposite edges of an image-receiving sheet, wrapped about said cylinder, throughout a major portion of both its engaged edges; and a control means common to all of said devices for positively spreading the elements thereof apart from one another, against the force of said springs, to permit insertion and removal of said edges of the sheet.

2. A sheet clamping and stretching mechanism in accordance with claim 1, in which said common control means comprises a rotatable shaft of non-circular peripheral shape passing between the gripping elements of each pair, on a line between said shaft and the slot of said cylinder, and in camming engagement with all of said elements.

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