July 25, 1967 C. E. SMYTH 3,332,345

SHEET ALIGNMENT APPARATUS

Filed May 24, 1965 3 Sheets-Sheet 1

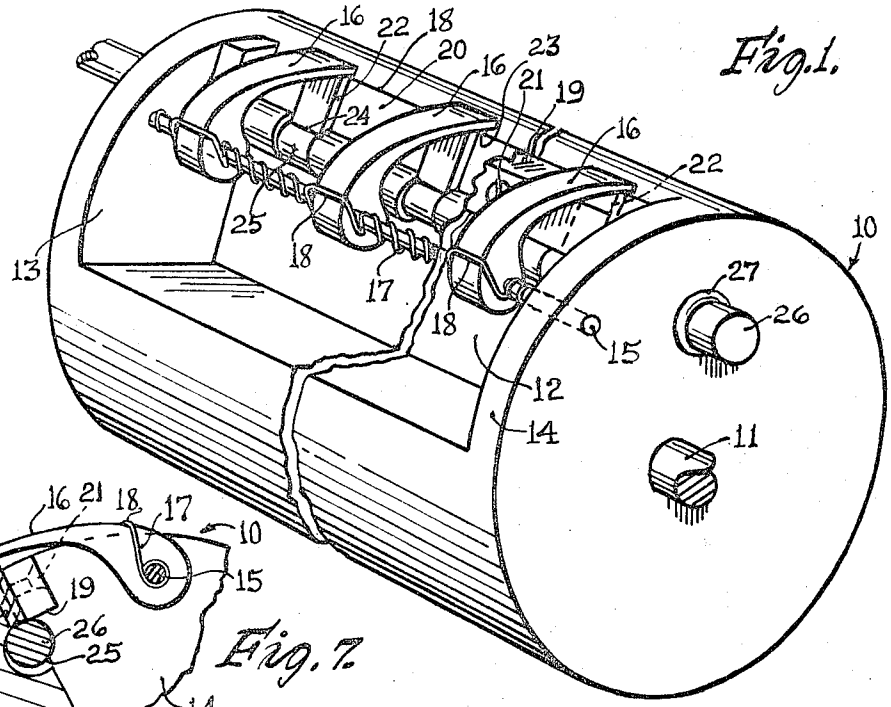


Fig. 1.

Fig. 7.

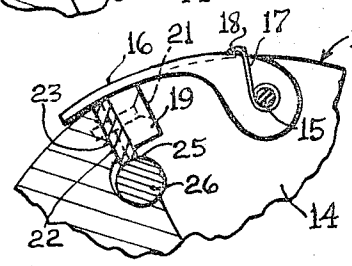


Fig. 6.

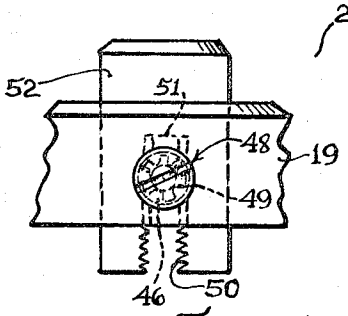


Fig. 11.

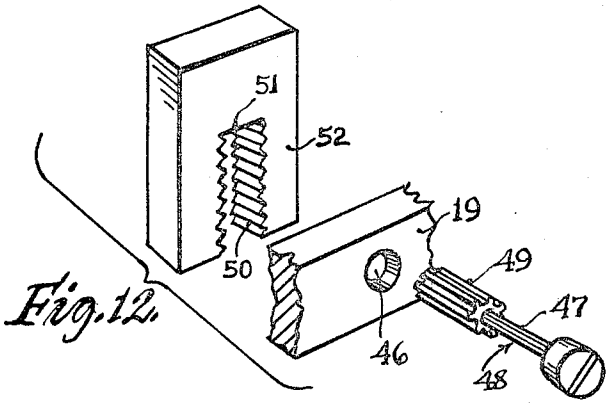


Fig. 12.

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SHEET ALIGNMENT APPARATUS

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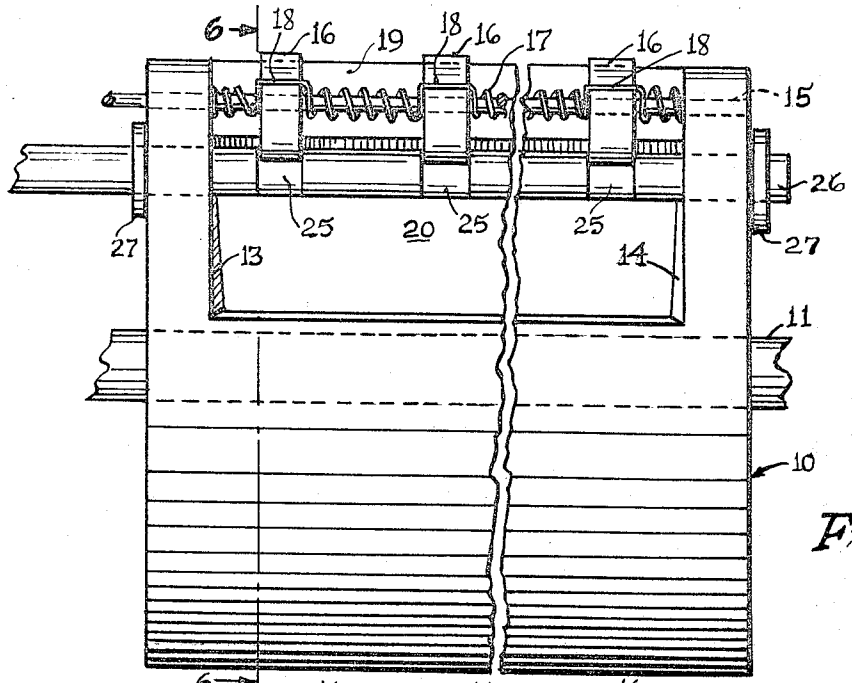


Fig. 2.

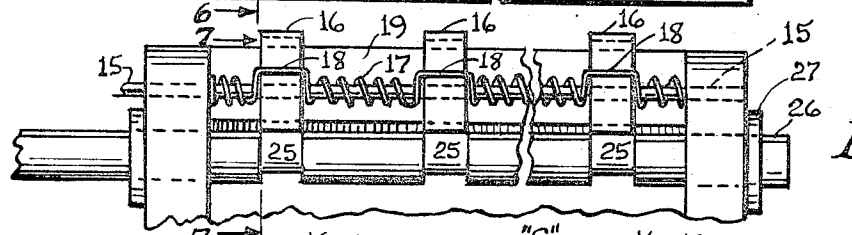


Fig. 3.

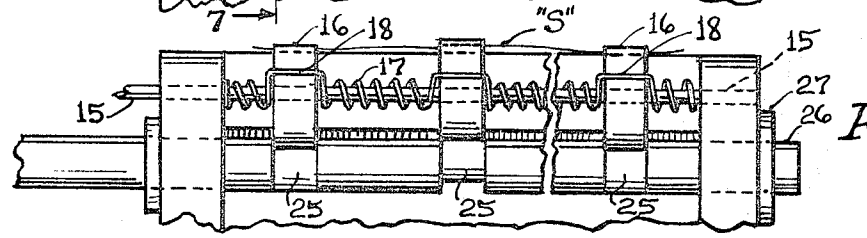


Fig. 4.

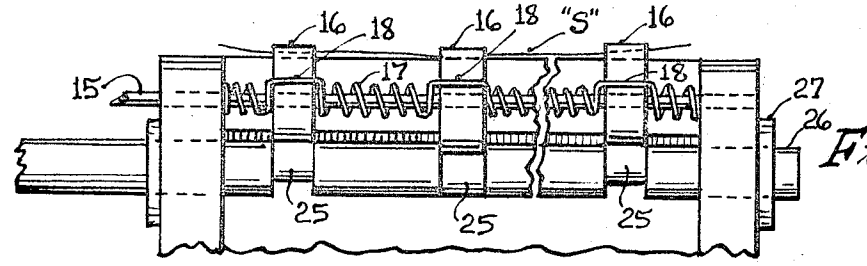


Fig. 5

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SHEET ALIGNMENT APPARATUS

Filed May 24, 1965 3 Sheets-Sheet 3

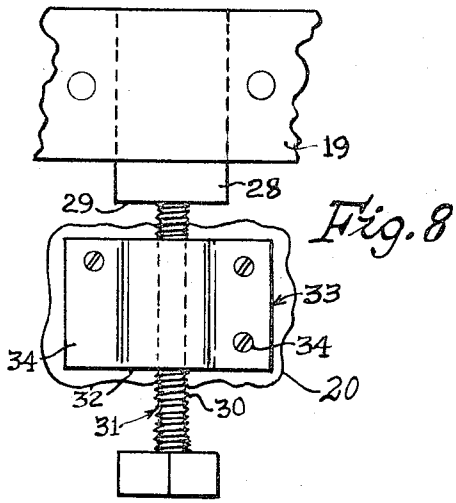


Fig. 8

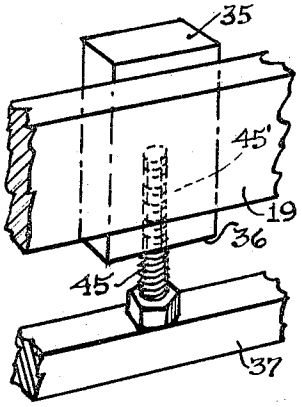


Fig. 10.

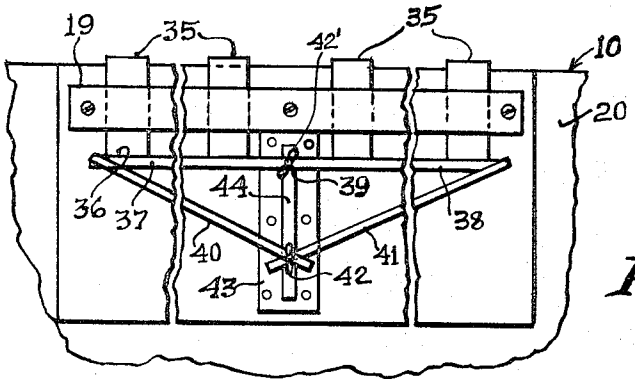


Fig. 9.

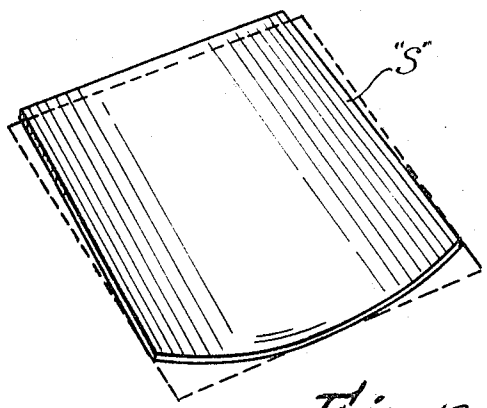


Fig. 13.

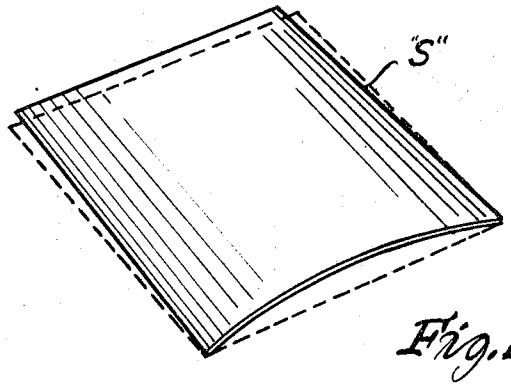


Fig. 14.

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3,332,345

SHEET ALIGNMENT APPARATUS

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Filed May 24, 1965, Ser. No. 458,252
2 Claims. (Cl. 101—409)

This invention relates to a new and useful improvement in a sheet alignment apparatus and more particularly to the structure by which sheets are maintained in correct registration as they are subjected to successive impressions made by printing machines and the like.

The structure and method of sheet control to be hereinafter described and claimed is adapted to be associated with a transfer cylinder type press such as is shown in Patents 2,100,852 and 2,577,099. It has been found that sheets, while going through the various units of the printing press, will frequently warp or distort especially at their trailing edges due to the effect of atmospheric and press conditions. This effect is most noticeable on offset presses in which the water used has a tendency to humidify the sheets and expand the trailing edges. The lateral stretch or fan-out of the sheets requires a corrective measure to be taken so that subsequent impressions printed thereon will be in precise registration throughout the entire area of the sheet.

In the past the corrective mechanism included a plurality of guide members for engaging and holding, not only the side edges of the sheet, but also for gripping and distorting through a horizontal plane, the leading edges of the sheets as they pass through the various printing stages.

One of the principal objects of this invention therefore is to provide an improved sheet registering apparatus which is conveniently adjustable to compensate for irregularities in the positioning of the sheet.

Another object of the invention is to provide in a sheet registering mechanism of this character, a means whereby the sheet is adjusted longitudinally as well as angularly transversely to the plane of the sheet whereby its register position can be corrected.

A still further object is to provide a method for effecting sheet control by elevating a portion or portions of the leading edges of the sheet relative to the cylindrical surface of the printing mechanism.

Other objects will appear hereinafter.

This invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

FIG. 1 is a fragmentary perspective view of the improved sheet registering mechanism;

FIG. 2 is a fragmentary front elevational view of the improved sheet registering mechanism;

FIG. 3 is a fragmentary detail front elevational view similar to FIG. 1 but showing certain portions of the mechanism in different operative positions;

FIG. 4 is a fragmentary detail front elevational view similar to FIG. 1 but showing certain portions of the mechanism in different operative positions;

FIG. 5 is a fragmentary detail front elevational view similar to FIG. 1 but showing certain portions of the mechanism in different operative positions;

FIG. 6 is a fragmentary detail sectional view taken on line 6—6 of FIG. 2;

FIG. 7 is a fragmentary detail sectional view taken on line 7—7 of FIG. 3;

FIG. 8 is a fragmentary detail sectional view showing a modified method of adjusting the gripper pads of the sheet registering mechanism;

FIG. 9 is a fragmentary front elevational view of a modified form of adjustment mechanism for the sheet registering mechanism;

FIG. 10 is a fragmentary detail view showing a modification of the adjustment mechanism for the sheet registering apparatus as shown in FIG. 9;

FIG. 11 is a fragmentary front elevational view of a modified form of adjustment apparatus for the sheet registering mechanism;

FIG. 12 is a fragmentary perspective view of the device shown in FIG. 11;

FIG. 13 is a diagram illustrating the corrected condition of a sheet subject to the operation of my improved sheet registering mechanism; and

FIG. 14 is a similar diagram to FIG. 13 showing the opposite corrective operation of my invention.

The present invention is primarily adapted to be used in a continuous offset printing operation wherein the sheets are continuously fed through a multiple unit press employing a plurality of rotatable cylinders. In the course of travel the sheet is caused to pass between cylinders of the press by means of transfer mechanisms which include a plurality of gripper fingers incorporated in each cylinder that function to receive and hold the leading edge of the sheet as it is transferred through its travels from cylinder to cylinder of the press unit.

The construction and operation of the gripper fingers as well as guide apparatuses employed in offset presses are shown and described in the aforementioned patents as well as in Patents Nos. 2,231,914 and 2,286,032. The specific structure and operation of the grippers and guide mechanisms shown and described in these patents are to be incorporated in association with my invention, but make up no part thereof, and as these structural components and their operation are well known in the art, they will not be shown or described herein except by reference to their functional association with the present invention.

As viewed in FIG. 1, I show an impression cylinder **10** rotatably supported upon a shaft **11**. The cylinder **10** has a portion of its peripheral area recessed as at **12** so as to provide a chamber for my improved sheet registering mechanism. Journalled between the end walls **13** and **14** as defined by the recess **12**, is a shaft **15**. Mounted upon the shaft **15** are a plurality of equally spaced gripper fingers **16**. Coiled about the shaft **15** is a spring **17** which includes a portion **18** in engagement with each of the gripper fingers **16** so as to yieldably hold the free ends thereof in facial abutment with the peripheral edge of the cylinder **10**.

By a suitable mechanism not shown or described in this application but well known in the art, the shaft **15** is caused to periodically rotate axially so as to raise all of the gripper fingers **16** out of engagement with the peripheral edge of the cylinder **10** during that portion of the printing operation when the sheet is being transferred onto the impression cylinder **10**. The leading edge of the sheet is brought into registration with the edge **18** of the recess **12** whereupon the shaft **15** is caused to be rotated in an opposite direction permitting the spring **17** to yieldably force the gripper finger **16** into contact with the leading edge of the sheet so as to securely hold the same onto the impression cylinder **10**.

Between the end walls **13** and **14** defined by the recess **12** and adjacent to the edge **18** of such recess **12**, is mounted a retaining bar **19**. This retaining bar **19** may be releasably connected to the recess wall **20** by means of screws **21** or the like. This retaining bar **19** functions to fixedly maintain a plurality of gripper pads **22** in a predetermined relation with respect to the complementary free ends of the gripper fingers **16**. This in a manner and for the purpose hereinafter made apparent.

Formed in the recess wall **20** and in open communication with the peripheral edge **18** of the recess **12** are a plurality of channels **23**. Positioned within each of the channels **23** is a rectangularly shaped gripper pad **22**. These gripper pads **22** are of a length greater than the length of the channels **23** so that such pads **22** may be moved longitudinally therethrough. The gripper pads **22** have their innermost end **24** resting upon circular cam surfaces **25**, formed circumferentially and periodically throughout the length of a rotatable cam rod **26** which extends through suitable bearings **27** provided by the end walls **13** and **14** of the impression cylinder **10** as shown in FIGS. 1 through 5. The cam surfaces **25** are eccentric relative to the axis of the rod **26** and so arranged that starting from opposite ends of the cam rod **26** they consist of sets so that as seen in FIGS. 3 through 5 different sets of gripper pads **22** associated therewith may be vertically adjusted relative to the remaining sets of pads. The cam rod **26** is adapted to be freely rotated axially so as to determined the location of each set of cam surfaces formed therein relative to their associated set of gripper pads.

Referring to FIGS. 5 and 7, it is clearly seen that when one portion of the cam surface **25** is positioned with respect to one of the pads **22**, such pad will have its opposite end in flush alignment with the peripheral surface of the cylinder **10** as shown in FIG. 6. In the event the cam rod **26** is rotated to relocate the cam surface **25**, the same will effect the elevation of the free end of the gripper pad **22** relative to the peripheral edge of the cylinder **10** as shown in FIG. 7. Thus by rotation of the cam rod **26**, the operator may determine the respective positioning of the gripper pads so that when the leading edge of the sheet is deposited thereon, such leading edge will assume the elevated arcuated plane defined by the gripper pads across the peripheral edge of the cylinder **10**.

When the cam rod **26** is rotated to position the gripper pads **22** in the desired position relative thereto, the retaining bar **19** may be fastened upon the wall **20** of the recess **12** and thus releasably retain the gripper pads **22** in such positions. Upon release of the retaining bar **19** and rotation of the cam rod **26**, those pads **22** which are no longer held in an elevated position by their respective cam surfaces **25** will by the action of the spring **17** upon the gripper fingers **16** force such pads **22** into their retractive position.

As illustrated in FIGS. 13 and 14, the registration of the sheet is achieved by elevating the opposite corners of the leading edge of the sheet S or by elevating the center portion of the leading edge of such sheet. The elevation is achieved by the adjustment of the gripper pads **22** in their respective channels **23** through the cam surfaces of the cam rod **26**. In FIG. 13, I illustrate the condition of a sheet subject to the above operation wherein the opposite corners of the leading edge have been elevated thus causing expansion of the sheet throughout its length with the trailing edge being stretched outwardly of the normal longitudinal plane thereof.

In FIG. 14, I show the corrected position of the sheet by elevating the middle portion of the leading edge thus causing the sheet to assume the position shown therein wherein the trailing edge moves inwardly of the normal plane of such sheet.

To achieve the above desired results all that an operator need do is to effect rotation of the cam rod **26**. This may be achieved through a manual control or by a suitable control mechanism responsive to the operator's instruction.

Referring to FIG. 8, I show a modified method of adjusting the gripper pads. In this form the gripper pad **28** has its bottom edge **29** resting upon the free end of a threaded shaft **30** of an adjusting nut **31**. The adjusting nut **31** is adapted to be threaded vertically through a suitable bearing **32** provided by a mounting bracket **33** connected by means of screws **34**, or the like, to the recess wall **20**. In the modified form, I maintain the use of the retaining bar **19** and thus when the same is sufficiently loosened from its connection to the recess wall **20**, the operator may rotate the adjusting screw **21** of each gripper pad **28** so as to raise or lower the same.

Referring to FIG. 9, I show another form of construction embodying my invention. In this form the gripper pads **35** have their lowermost edge **36** adapted to rest upon a support which comprises two sections **37** and **38** pivotally connected together as at **39**. Each of the sections **37** and **38** of the support has pivotally connected intermediate their ends pivot links **40** and **41** respectively. The free ends of the sections **37** and **38** as well as the free ends of the links **40** and **41** are adjustably connected, by means of wing bolts **42** and **42'** or the like, to a mounting bracket **43** which contains an elongated slot **44** behind which are retained suitable nuts, not shown, into which the wing bolts **42** and **42'** are adapted to be securely threaded. By this arrangement, if the sections **37** and **38** and/or the links **40** and **41** have their free ends moved through the slot **44** as shown in FIG. 9, the sections **37** and **38** of the support will likewise pivot, thus causing each of the gripper pads **35** to be adjustably positioned relative to the periphery of the cylinder.

To achieve an even finer adjustment of each of the gripper pads **35**, a modification may be made thereto as shown in FIG. 10. In such showing, each of the gripper pads **35** has its bottom edge **36** provided with a threaded bore **45'** into which is adjustably threaded a screw **45**, the head of which rests upon a portion of the adjustable support (section **37** as shown in FIG. 9). By this arrangement all of the gripper pads **35** may be simultaneously adjusted by the mechanism shown in FIG. 9 and then the individual screws **45** of each gripper pad **35** may be threaded into or out of the bottom edge **36** thereof to further adjust each selected gripper pad.

In FIG. 11, I show another modification of an adjusting means wherein the retaining bar **19** is provided with a plurality of apertures **46** through which the smooth shank **47** of a pinion **48** projects. The tooth end **49** of the pinion **48** engages a rack segment **50** positioned within a slot **51** formed in the body of the pad **52**. By this arrangement the retaining bar **19** is loosened and each pinion **48** is rotated so as to raise or lower its associated gripper pad **52** into the desired position relative to the periphery of the cylinder.

Each of the modifications hereinbefore described permits the elevated adjustment of a plurality of gripper pads which cooperate with the gripper fingers **16** to receive and position the leading edge of a sheet upon the impression cylinder **10**. As hereinbefore explained, the adjustment of the gripper pads permits an arcuated distortion of the leading edge of the sheet through a vertical plane relative to the periphery of the cylinder **10**, thus effecting proper registration of the sheet.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a sheet alignment apparatus including a printing machine having a sheet receiving cylinder comprising

(a) a plurality of gripper fingers carried by said cylinder for releasably securing the leading edge of the sheet to be printed, upon the cylinder,

(b) a plurality of gripper pads movably mounted on said cylinder and positioned beneath said gripper fingers and cooperating therewith for releasably securing the leading edge of the sheet onto the cylinder,

(c) a retaining bar carried by said cylinder and extending across each of said gripper pads intermediate their ends for releasably holding said gripper pads on said cylinder with certain free ends thereof positioned relative to the periphery of the cylinder, and

(d) a movable supporting element in contact with the opposite ends of each of said pads and cooperating with said retaining bar for simultaneously radially adjusting said gripper pads individually with the said certain free ends thereof in selected elevated positions relative to the periphery of said cylinder so as to secure the leading edge of the sheet in an arcuated elevated plane relative to the periphery of said cylinder so that the trailing end of the sheet is placed in proper registration for a succesive printing operation.

2. In a sheet alignment apparatus as defined by claim 9 wherein said movable supporting element is a rotatable rod carried by said cylinder and having a plurality of cam

surfaces formed circumferentially about said rod with certain of said cam surfaces eccentric with respect to each other and said rod and supporting a gripper pad so that upon axial rotation of said rod different cam surfaces will support said pads in different elevated relation to the periphery of the cylinder.

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