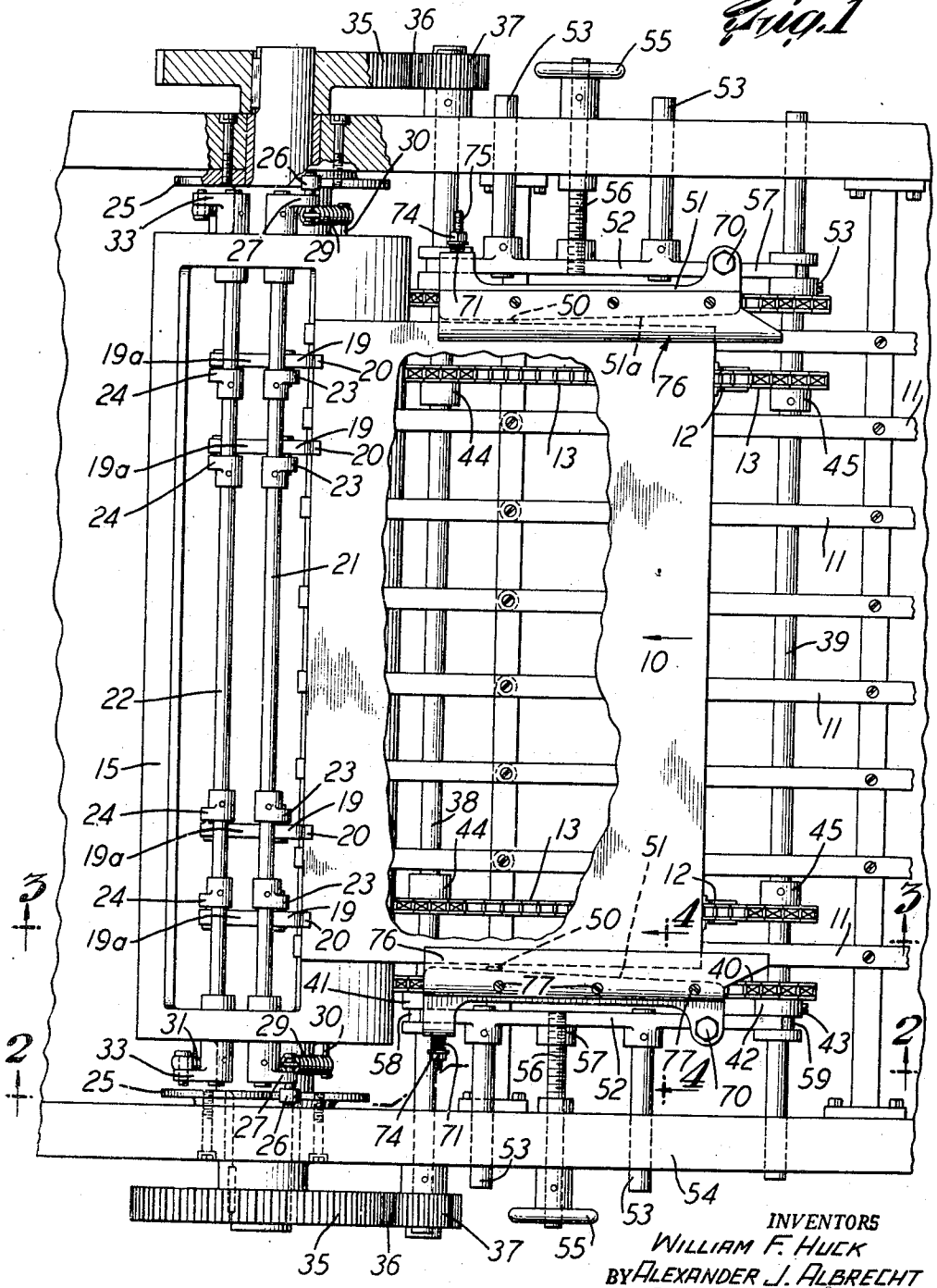
Jan. 18, 1955 W. F. HUCK ET AL 2,699,940

REGISTERING MEANS FOR SHEET-FED PRINTING PRESSES

Original Filed Dec. 15, 1949 5 Sheets-Sheet 1

Fig. 1



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REGISTERING MEANS FOR SHEET-FED PRINTING PRESSES

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Fig. 2

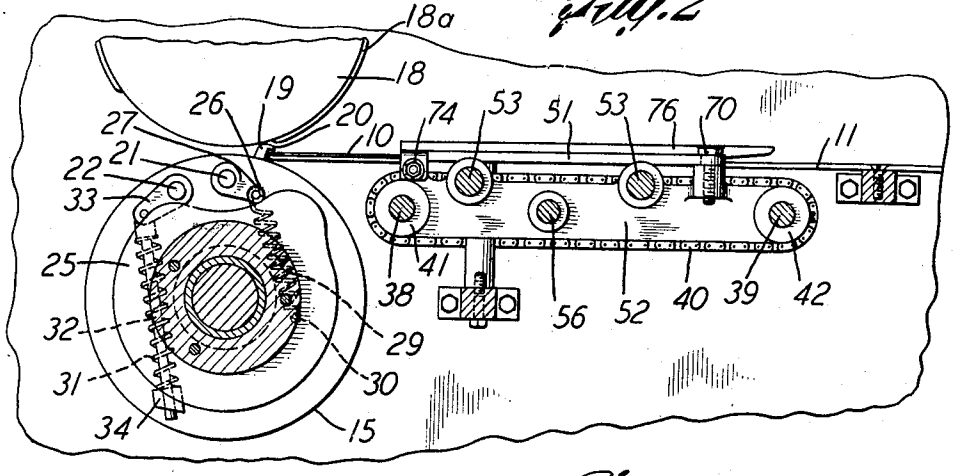


Fig. 3

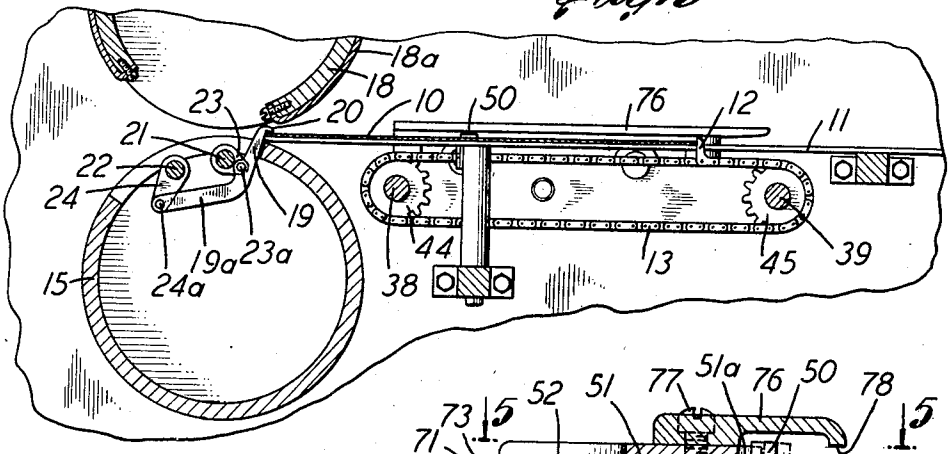


Fig. 4

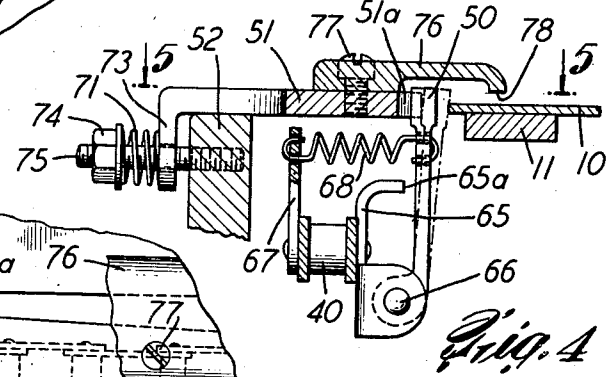
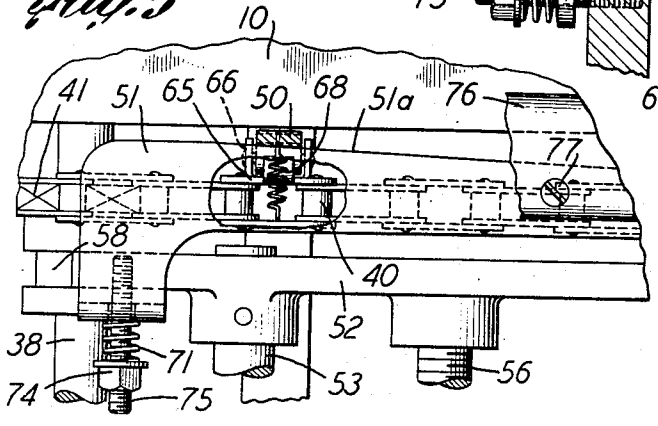


Fig. 5



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REGISTERING MEANS FOR SHEET-FED PRINTING PRESSES

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Fig. 6

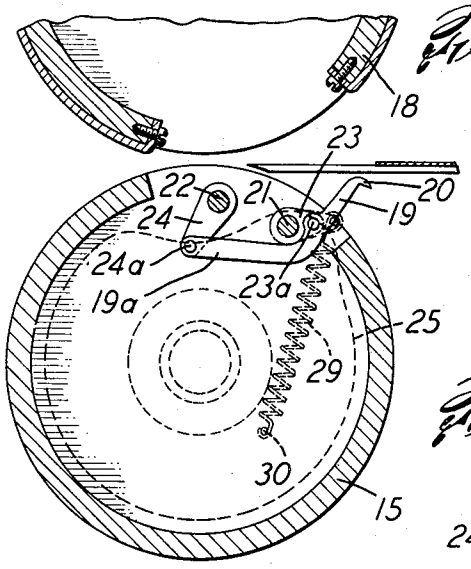


Fig. 11

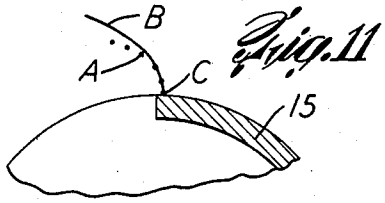


Fig. 9

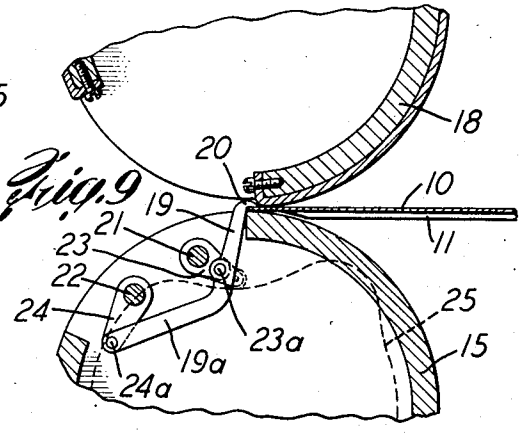
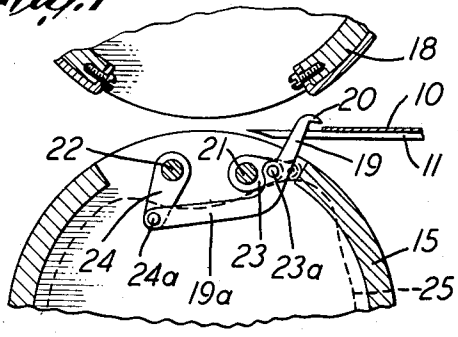


Fig. 7



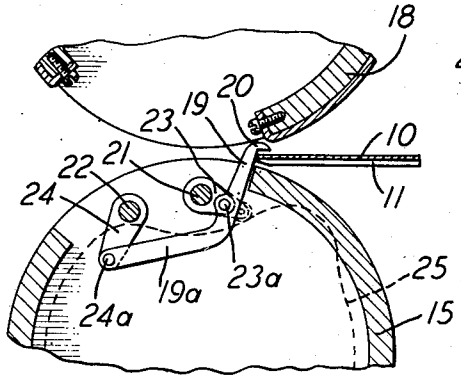


Fig. 8

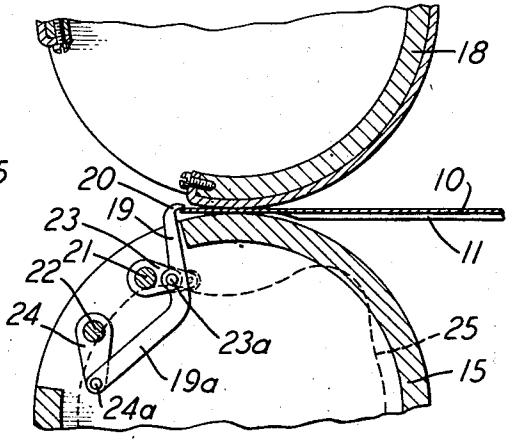


Fig. 10

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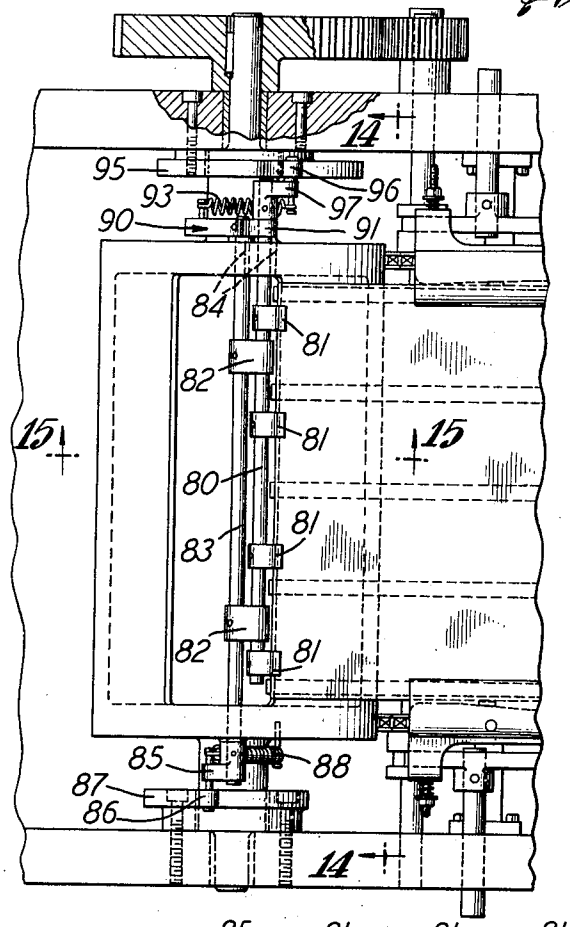
Fig. 12



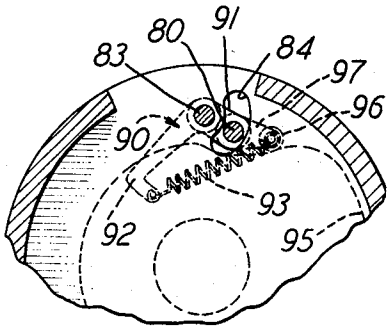
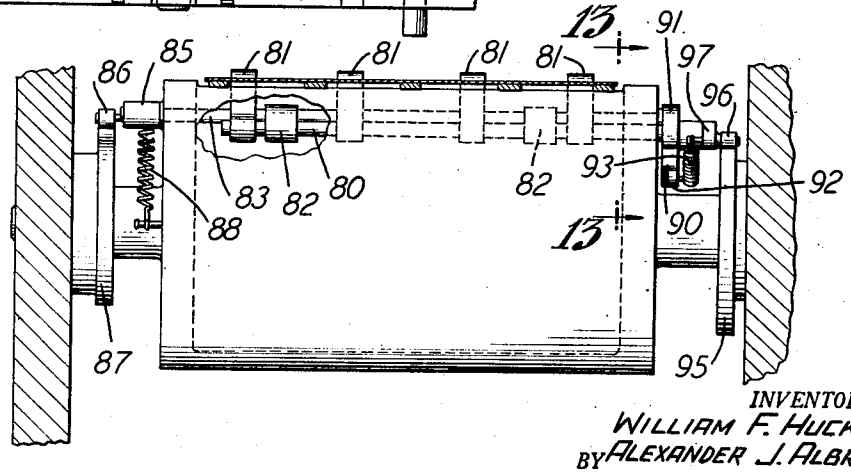


Fig. 13

Fig. 14



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REGISTERING MEANS FOR SHEET-FED PRINTING PRESSES

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Fig. 15

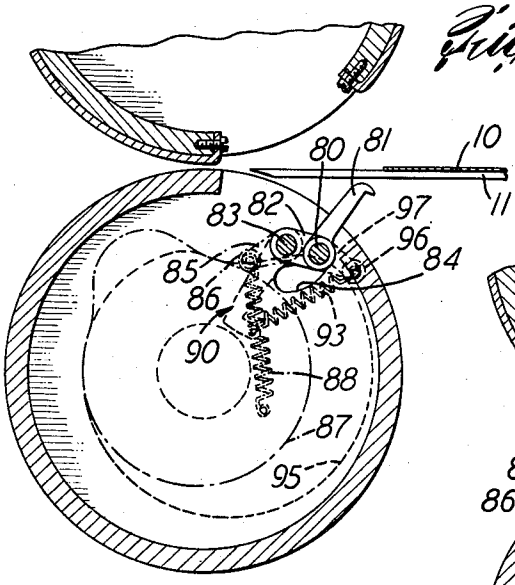


Fig. 18

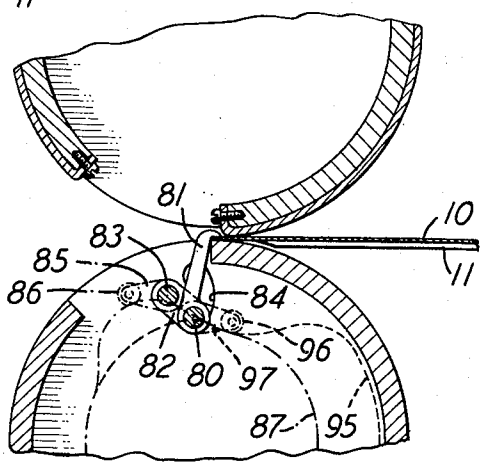
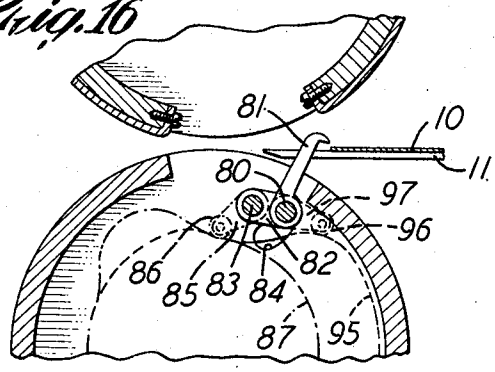
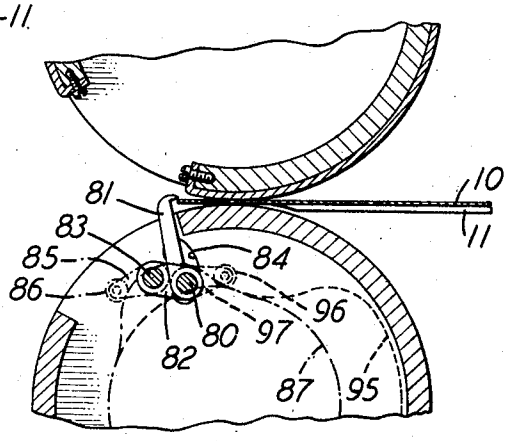


Fig. 16





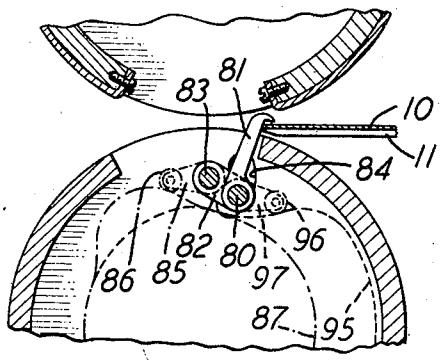


Fig. 19

Fig. 17

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REGISTERING MEANS FOR SHEET-FED PRINTING PRESSES

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Original application December 15, 1949, Serial No. 133,192. Divided and this application April 15, 1952, Serial No. 282,772

10 Claims. (Cl. 271—49)

This invention relates to sheet-fed printing presses and more particularly to such presses of the type used primarily to print on sheet metal, cardboard or other materials in the form of sheets stiff enough to be fed to printing position by being pushed from their trailing edges.

In printing presses of that type the mechanism usually employed for bringing each sheet into register with the printing member operates to force the leading edge of the sheet against front register elements and one side edge of the sheet against a side register element by applying pressure to the opposite edges of the sheet. The front register elements are surfaces of sheet grippers which are carried by an impression cylinder and operated by mechanism connected with it.

The constructions used in existing presses are such that the grippers and their front register surfaces have a linear speed in the direction of travel of the approaching sheet that is considerably less than the surface speed of the impression cylinder. A sheet moving forward to printing position and momentarily retarded by contact with the moving register surfaces does not move at cylinder surface speed at the moment the grippers close upon it, so if perfect registration is to be attained a considerable pushing force is required at the trailing edge of the sheet to bring it up to the cylinder surface speed and maintain firm contact between the leading edge and the register surfaces. The magnitude of the pushing force necessary depends upon the acceleration required to impart the higher speed to the sheet within the short interval occupied by closing of the grippers.

Since the pushing force necessary increases at a rate proportional to the weight of a sheet and proportional to the square of the speed of the press there is a severe limitation upon the production speed of printing presses of the type under consideration. If the press speed and pushing force exceed a certain limit the sheets cannot withstand the force at their edges without buckling or indenting, so the force applied and therefore the press speed must be limited. If the pushing force is less than a certain minimum, which minimum will vary with the press speed, the sheet will slip under the grippers, edge contact with the register surfaces is not maintained and misregister results.

Side register of the sheets also presents a problem. In customary printing press construction lateral positioning of the sheet is effected most commonly by a side register element which moves transversely to the line of sheet travel and makes contact with a side edge of each sheet only momentarily just before the grippers close upon it. Such register elements are generally in the form of small rollers mounted on axes transverse to the plane of the sheet, so that the area of contact with the sheet is small. The rollers and their mountings are of substantial mass and, especially at high speeds, have more or less the action of hammers with momentarily too much pressure which tends to indent the sheet but is not continued as a sustained pressure to insure lateral movement of the sheet against an opposite register-stop. Damage to the sheet edge and mis-registration result.

Side register devices moving with the sheet have been proposed to overcome this difficulty but the devices proposed have been costly, inconvenient for installation and unsatisfactory in operation; also they have presented sheet engaging means of limited contact area yet of considerable mass, which are liable to damage edges of the sheets when accelerated to follow the sheet movement just before the time of gripper action.

The general purpose of this invention is to provide improved registering means for sheet-fed printing presses of the type under consideration and for other analogous uses which make it practical to operate the presses at increased speeds and to obtain accurate registration without damage to the edges of the sheets being printed.

A more particular object is to provide improved means for registering the leading edge of the sheets which will operate effectively and accurately at high press speeds.

A further object of the invention is to provide improved means for registering the side edges of the sheet which will insure accurate positioning thereof at high press speeds and will not damage the sheets.

According to this invention sheets successively fed to the printing zone between a printing member and a rotating impression cylinder are each brought into accurate register with the printing member by means of front edge positioning elements and side edge positioning elements which all move together in even contact with the sheet at a linear speed equal to that of the surface of the impression cylinder as the sheet approaches a predetermined gripping point where it is held to the cylinder surface.

The desired front edge positioning may be obtained by providing register elements on the impression cylinder, which make contact with the leading edge of an approaching sheet ahead of the gripper closing point and define a path of abutment for the point of contact of that edge which extends to the gripping point as an involute of a circular section of the cylinder surface. In order to avoid relative motion and friction between the moving sheet and these register elements, the latter may be moved relative to the gripping point, as the cylinder rotates, in such manner that their sheet contacting surfaces progress on such an involute from an outwardly projected position where they extend across the path of the leading edge of an approaching sheet to an inward position adjacent the gripping point. The effective linear motion of the front register surfaces thus is tangential with respect to the printing zone and occurs at a speed corresponding to the surface speed of the cylinder until the register elements have reached a final inward position where grippers, preferably though not necessarily carried on the free ends of these elements, act to grip the leading edge of the sheet to the impression cylinder surface. Accordingly, the forces required for front register contact remain moderate and constant at all press speeds.

The required side edge positioning may be obtained through an arrangement of co-acting, relatively stationary and moving elements along at least one side of the sheet path. A moving side register or positioning element of little mass, which presents a relatively large register surface to a side edge of the sheet approaching the printing zone, is moved along a relatively stationary guide or cam surface with mathematically determined accuracy into smooth contact with the sheet edge. The moving element is advanced toward the front register elements with each sheet at a speed in tangential or sheet-feeding direction equal to the speed of the sheet, and while it moves forward it is gradually brought laterally toward the desired position and into contact with a side edge of the sheet so as to reach that position and insure accurate lateral positioning of the sheet just before the grippers close. A similar arrangement may be provided on the opposite side of the sheet, its presser or register element moving forward with the sheet and the other side register element so that positive engagement between the latter and the sheet will be insured. In a press for printing fairly massive sheets, such as metal sheets, the register arrangement on one side of the sheet path is provided with a guide or cam member which is held yieldably at a desired registering position and is displaceable laterally from that position whenever the lateral pressure exerted through the advancing register element by the side edge of an advancing sheet exceeds a predetermined value. The spring force or other force applied to position said member may be selected so that it will resume its normal position and thus move the displaced sheet laterally to the desired register position before the leading edge of the sheet reaches the gripping point.

Other objects, features and advantages of this invention and a preferred manner of practicing it will be apparent from the following description of mechanism embodying same, for the purpose of which description reference should be had to the accompanying drawings, in which

Fig. 1 is a plan view of sheet feeding and registering mechanism embodying the principles of the invention, certain parts being shown in section.

Fig. 2 is a sectional view taken on line **2—2** of Fig. 1.

Fig. 3 is a sectional view taken on the line **3—3** of Fig. 1, showing the several sheet positioning elements in the condition of first engagement of an advancing sheet with the front register surfaces.

Fig. 4 is a sectional detail view, taken on the line **4—4** of Fig. 1, of the side positioning mechanism.

Fig. 5 is a plan view of the side positioning mechanism seen in Fig. 4, with certain parts broken away.

Figs. 6, 7, 8, 9 and 10 are fragmentary vertical sections showing successive positions assumed by the front register and gripper mechanism in operation.

Fig. 11 is a diagram indicating the approximate path of movement of the sheet-engaging surface of a front register element relative to the gripping point on the surface of the impression cylinder.

Fig. 12 is a plan view, partly in section, showing the registering and gripping mechanism of another embodiment of the invention.

Fig. 13 is a fragmentary vertical section taken on line **13—13** of Fig. 14.

Fig. 14 is a front elevation, partly in vertical section, of the impression cylinder and front edge positioning mechanism as viewed approximately from line **14—14** of Fig. 12.

Figs. 15, 16, 17, 18 and 19 are fragmentary vertical sections showing successive positions assumed by the front register and gripper mechanism of the second embodiment in operation.

In the arrangements shown for the purposes of illustrating the principles of the invention, registering mechanism is provided whereby the leading edge of each sheet advancing to the printing zone engages front register elements which are carried by an impression cylinder **15** and are operated as it rotates so that the point of engagement of the sheet with each register element moves toward a gripping point on the cylinder surface in a curve which is approximately an involute of a circular cross section of that surface. Accordingly, during registering engagement of the sheet and until it has reached gripping position its speed of movement can be kept constant. Provision is made also for lateral registration of the sheet by mechanism which moves smoothly into contact with a side edge of the advancing sheet at a speed in the direction of sheet movement equal to the linear speed of the front register points in that direction, so that the required proper positioning of the whole sheet with respect to the impression cylinder and a printing member **18***a* on a cooperating printing cylinder **18** will be obtained without damage to the edges of the sheet.

Referring more particularly to Figs. 1, 2 and 3, the sheet **10** is moved forward on a table comprising parallel bars or runners **11** by pusher elements **12** on chains **13**. The chains and pushers are driven at the surface speed of the cylinders **15** and **18** by mechanism to be described, and the pushers engage the trailing edge of the sheet so as to advance it into printing position between the two cylinders. In order to obtain accurate positioning of the leading edge of the sheet with respect to printing member **18***a* at printing position a plurality of register elements **19** are carried by one of the cylinders, more conveniently the impression cylinder, and these elements are brouhgt into contact with the advancing sheet as it approaches printing position and move evenly with it until it reaches substantially the point of tangency to the impression cylinder, at which point it is gripped to the cylinder surface by grippers **20** which may be integral parts of the register elements and are so shown.

The register grippers **19** are so controlled in their approach to sheet gripping position that their points of contact with the sheet follow a path, relative to the gripping point on the rotating impression cylinder surface, which corresponds to an involute of a cross section of that surface. At that point the gripper ends **20** close upon the leading edge of the sheet to hold it to the impression cylinder as the printing member **18***a* comes into action. The two cylinders having thus taken hold of the sheet, elements **19** promptly afterward are released from engagement with it by being moved first outwardly and beyond its leading edge and then angularly away from it so that the sheet can advance freely beyond the printing zone in a straight line. Then these elements are carried around the cylinder orbit in an idle position until they again approach the sheet path, when they are projected forwardly and outwardly to extend across that path first ahead of the leading edge of another approaching sheet and then in contact with the latter.

The particular mechanism shown in Figs. 1 to 10 for giving these movements to the front register elements comprises two rock shafts **21**, **22** parallel to the impression cylinder axis, journalled in and extending through the cylinder heads. Sets of arms **23**, **24** keyed to the shafts **21**, **22**, respectively, carry pivoted thereto the register and gripper elements **19**, each of which has a swivel connection at **23***a* with an arm **23** and has a tail portion **19***a* swivelled at **24***a* to an arm **24**. The rock shaft **22**, which controls the angular position of tail portions **19***a*, is urged clockwise by a compression spring **31** acting on shaft **22** through an arm **33** keyed to an end of the shaft; spring **31** being carried on a guide rod **32** pivoted to arm **33**, and bearing against lug **34** on the impression cylinder head. The movements of the rock shafts, arms and front register elements are controlled by a cam or cams **25** fixed to side frames of the press, against which cams bear rollers **26** carried on arms **27** keyed to the ends of shaft **21**. The rollers are held in engagement with the cams by tension springs **29** anchored on pins **30** fixed in the cylinder heads.

The design of the cams and the arrangement of the several parts is such that the impression cylinder rotation bringing the register elements **19** into the zone of their action produces outward movement of these elements to a position across the path of the leading edge of an approaching sheet, i. e., they move from below the sheet as seen in Fig. 6 to a position extending above and ahead of the sheet as seen in Fig. 7, after which a dip in cam **25** gives them a forward relative movement to sheet engaging position as seen in Fig. 8. From the moment when the leading edge of the advancing sheet engages the register elements, the cam and linkages cause the register surfaces of the elements to approach the gripping point on the cylinder surface along a curve which corresponds to an involute of the cross-section of the cylinder, as indicated diagrammatically in Fig. 11 wherein the dotted curve A represents the preliminary and the sheet-contacting movements of the register surfaces and the solid line B represents a true involute of the cylinder cross-section terminating at gripping point C on the cylinder surface. Upon the completion of the latter movement the gripper ends **20** act to grip the sheet to the cylinder, as seen in Fig. 9. A continuing valley in the cam **25** then causes the grippers to hold the sheet for an interval sufficient to permit retention of the sheet between the printing cylinder and the impression cylinder, after which a swell of the cam causes the register elements to move outwardly away from the sheet and then entirely out of its path under continued cylinder rotation. In the arrangement shown there is little relative movement between the register points on elements **19** and the leading edge of a sheet being positioned by them; so it is not necessary to give a particular shape to the faces of these elements in order to maintain proper contact.

The printing and impression cylinders and chains used to carry the sheet feeding and side registering elements are driven by suitable gearing in the necessary timed relation. At each end the cylinders are journalled in the side frames of the press. At least one of the journals carries a gear **35** which drives through an idler pinion **36**, a pinion **37** keyed to a transverse shaft **38** located below a forward part of the sheet feeding table. Shaft **38** in turn drives a parallel shaft **39** below a backward part of the table through chains **40** which pass at the front over sprockets **41** splined to shaft **38** and, at the back, over sprockets **42** releasably pinned to shaft **39** by set screws **43**. Sheet feed chains **13** carrying pushers **12** are each driven by a back sprocket **45** fixed to shaft **39**, and guided over a front sprocket **44** which is freely rotatable on shaft **38**. The gears **35**, **36** and **37** and the several sprockets are so proportioned that the linear speed of the chains **13**

and 40 will be the same as the surface speed of the impression cylinder.

The invention provides an improved lateral registering mechanism for insuring accurate positioning of the sheet as it is advanced to the printing zone and especially at the moment of its engagement by the front register elements on the impression cylinder. As shown, the lateral registering mechanism is duplicated on opposite sides of the machine, but elements on one side are mounted and adjusted so as to yield laterally under excessive sheet pressure, while elements on the other side are held to a fixed position in order to insure a definite registering position for each sheet.

In the form shown, a chain 40 at each side of the feed table carries a side register or presser finger 50 which moves forward with a sheet being fed by pushers 12 at the speed of movement of the sheet. The position of each finger is determined by a cam 51 which is disposed along one side of the sheet path and against which the finger slides during forward movement so as to progress gradually from a position somewhat away from the desired path of the sheet to a predetermined side registering position where the opposite fingers will hold the sheet between them in proper registration with printing member 18*a* and the front register elements 19.

Each sprocket chain 40 has a wide link plate 65 (Figs. 4 and 5) to which the side register finger 50 is pivoted at 66. A plate 67 on the opposite side of the chain provides anchorage for a spring 68 which holds finger 50 against the face 51*a* of cam 51, which cam face slopes laterally inward toward the desired path of the sheet 10 and forces the finger 50 gradually against the sheet during the feeding movement to provide registration thereof. A stop 65*a* on plate 65 limits the movement of finger 50 when the cam is not engaged thereby.

In order to adjust the feeding and registering mechanism for sheets of different sizes, each side of the press comprises a bracket 52 which supports the cam 51 on that side and is fixed to guide rods 53 which slide in the adjacent side frame 54 of the press. Each bracket 52 is movable to any desired lateral position by turning a hand wheel 55 on a screw 56 which is threaded into a socket 57 forming a part of the bracket. One end of the bracket engages in a groove 58 in the hub of the sprocket wheel 41 to move it along the shaft 38 to which it is splined, and the other end engages in a groove 59 in the hub of sprocket wheel 42 for the same purpose. When set screws 43 of sprocket wheels 42 are released adjustment of the side registering mechanism can be made by turning the hand wheel 55, and adjustment of the relative position of the pushers 12 on feed chains 13 can be made by rotating the shaft 39 while holding the sprocket wheels 42 in fixed position.

As seen in further detail in Figs. 1, 4 and 5, each cam 51 is pivoted at 70 to the corresponding bracket 52, and its forward end is held yieldably inward by a spring 71 compressed between depending ear 73 on the cam and an adjustable nut 74 on a stud 75 secured in the bracket. The finger 50 is moved gradually inward against the sheet 10 by engagement with the cam face 51*a* during the feeding movement until, just before the leading edge of the sheet is gripped against the cylinder, the finger passes the front end of the cam and is retracted against stop 65*a* by spring 68.

A top guide and cover member 76 is secured by screws 77 to the top of the cam and extends over the cam face and the path of finger 50 to a position above the sheet path where a depending lip 78 is provided to keep a sheet 10 from bulging away from the finger. The cam 51 on one side of the press preferably has its tensioning nut 74 tightened to hold it in fixed position, so that its finger 50 provides a positive register position for one side of the sheet 10, while the similar nut on the other side of the press is shown backed off to give the desired compression to its spring 71 whereby the corresponding finger 50 on that side will yieldably position the sheet.

In the second illustrative embodiment of the invention, as seen in Figs. 12 to 19, the sheet feeding and side registering elements are substantially the same as those above described, but a different form of cam-controlled operating mechanism is provided for the front register elements. Again, however, those elements are carried by the impression cylinder, and their effective movements relative to it and in coordination with the other elements are substantially the same as in the embodiment first described.

Here the combined register-gripper elements 81 are carried by a swinging rock shaft 80 which in turn may be carried by arms 82 fastened to a rock shaft 83 fixed in the impression cylinder, and two cams 87 and 95 are provided on opposite sides of the press frame to bring about the required movements of the rock shafts and register elements as the impression cylinder rotates. Rock shaft 83 is journalled in the cylinder heads, while swinging rock shaft 80 is carried rotatably in the arms 82 and extends through and moves freely in a slot 84 in one of the cylinder heads. The front register elements 81 are pinned to shaft 80 so as to move with it, and its extended end beyond slot 84 carries an arm 97 which holds a roller 96 against cam 95. An arm 85 keyed to rock shaft 83 carries a roller 86 bearing on cam 87 to control the rocking movement of shaft 83 and thereby the position of shaft 80 relative to the impression cylinder surface.

Ordinarily the cam 87 and the control arm and roller which control the radial movement of rock shaft 83 would not be shown in Figs. 15 to 19 because of the position at which the sections are taken, but for the purposes of disclosure of the operation cam 87 is shown in broken lines to indicate its relative position.

A tension spring 88 is connected to an extension of the pin on which roller 86 is mounted and anchored on a pin in the adjacent cylinder head to hold this roller in contact with the cam 87. In addition to the arms 82 carrying rock shaft 80 from rock shaft 83, a lever member 90 (Figs. 12 and 13) keyed to shaft 83 has one arm 91 similar to the arms 82 providing an additional journal support for shaft 80 outside of the cylinder end and has another arm 92 which is shown as L-shaped providing anchorage for a tension spring 93. Spring 93 is connected to an extension of the pin on which roller 96 is mounted and maintains this roller in contact with the stationary cam 95.

The design of the cams 87 and 95 and the arrangement of connected parts is such that the points of contact between the advancing sheet and the register elements 81 move toward the gripping point on the impression cylinder, during the approach of the sheet to printing position, along a curve which corresponds to an involute of a section of the impression cylinder. The several positions of parts appearing in Figs. 15 to 19 indicate the operation obtained and indicate that it is like the operation described in connection with Figs. 1 to 11.

The foregoing particular description of selected embodiments of the invention is illustrative merely and is not intended as defining the limits of the invention. Various modifications in form, construction and arrangement may be made without departing from the spirit of the invention.

We claim:

1. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, and means acting upon said element as it is advanced by said conveyor to deflect said element laterally relative to said conveyor and guide it through a predetermined side edge registering path sloped toward the path of the sheet.

2. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally

relative to said conveyor, and a normally stationary cam mounted at said side of said table having an elongated surface disposed in the path of advance of said element and sloped gradually toward the path of the sheet for deflecting said element laterally into registering contact with said side edge as said element is advanced by said conveyor.

3. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, and a normally stationary cam mounted at said side of said table in the path of advance of said element for deflecting said element laterally into registering contact with said side edge, said cam having an elongated backward portion gradually sloped laterally toward the path of the sheet and a merging forward portion extended parallel to said sheet path and along which said element is advanced by said conveyor in sustained contact with said side edge.

4. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, yieldable means biasing said element laterally away from the sheet path to a predetermined position relative to said conveyor, and means acting upon said element as it is advanced by said conveyor to deflect said element laterally relative to said conveyor against the bias of said yieldable means and guide said element through a predetermined side edge registering path sloped gradually toward said sheet path.

5. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, and a normally stationary cam mounted at said side of said table in the path of advance of said element for deflecting said element laterally into registering contact with said side edge, said cam having an elongated backward portion gradually sloped laterally toward the path of the sheet and a merging forward portion extended parallel to said sheet path and along which said element is advanced by said conveyor in sustained contact with said side edge, said cam being pivoted at its backward end on a relatively fixed vertical axis, and yieldable means normally biasing its forward end laterally toward said sheet path to a predetermined registering position.

6. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, and a normally stationary cam mounted at said side of said table in the path of advance of said element for deflecting said element laterally into registering contact with said side edge, said cam having an elongated backward portion gradually sloped laterally toward the path of the sheet and a merging forward portion extended parallel to said sheet path and along which said element is advanced by said conveyor in sustained contact with said side edge, a pivotal mounting for the backward end of said cam about which said forward portion is swingable laterally, a lateral stop for positioning said forward portion, spring means normally biasing said cam laterally toward said sheet path into contact with said stop, and a normally stationary frame member supporting said mounting, said stop and said spring means.

7. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, a conveyor carrying said element and movable along said side in an extended path to advance said element therealong, said conveyor moving through said path in a direction parallel to the direction of the feeding of the sheet, means synchronized with said feeding means for so moving said conveyor through said path at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, and a normally stationary cam mounted at said side of said table in the path of advance of said element for deflecting said element laterally into registering contact with said side edge, said cam having an elongated backward portion gradually sloped laterally toward the path of the sheet and a merging forward portion extended parallel to said sheet path and along which said element is advanced by said conveyor in sustained contact with said side edge, a pivotal mounting for the backward end of said cam about which said forward portion is swingable laterally, a lateral stop for positioning said forward portion, spring means normally biasing said cam laterally toward said sheet path into contact with said stop, and a normally stationary frame member supporting said mounting, said stop and said spring means, said frame member being adjustable in a direction transverse to said sheet path to adjust the mechanism for sheets of different sizes.

8. In a sheet feeding and registering mechanism including a stationary sheet feed table and means for feeding a sheet thereover, a side register element movable along a side of said table to engage and position a side edge of the sheet, an endless conveyor carrying said element, said conveyor being entirely below said table and having an elongated upper flight extending and moving in a direction parallel to the direction of the feeding of the sheet, said element projecting upwardly from said conveyor to a position above said table as the conveyor advances said element through said upper flight, means synchronized with said feeding means for moving said conveyor through said flight at the same speed as the speed of the feeding of the sheet, means mounting said element so that it is deflectable laterally relative to said conveyor, a normally stationary cam mounted at said side of said table having an elongated surface disposed in the path of advance of said element and sloped gradually toward the path of the sheet for deflecting said element laterally into registering contact with said side edge as said element is advanced by said conveyor, a normally stationary frame member supporting said cam, said frame member and said conveyor each being adjustable in a direction transverse to said sheet path to adjust the mechanism for sheets of different sizes, and means interconnecting said frame member and said conveyor for simultaneous adjusting movements thereof.

9. In a sheet-fed printing press or the like including a cylinder rotatable through a sheet gripping zone and a stationary sheet feed table adjacent thereto, a pusher for feeding a sheet along said table into said zone by engaging the trailing edge of the sheet, a register element movable along said table to engage a side edge of an advancing sheet, parallel endless conveyors entirely below said table respectively carrying said pusher and said side register element therealong, said conveyors having advancing flights extending and which move in a direction parallel to the direction of feeding of the sheet, said pusher and said side register element extending upwardly

from said flights to working positions above said table, a relatively fixed cam above and at one side of said table in the path of advance of said register element to move said element laterally into contact with the sheet, and common driving means for said conveyors synchronized with the rotation of said cylinder to advance said pusher and said side register element in said direction at the surface speed of said cylinder.

10. In a sheet-fed printing press or the like including a cylinder rotatable through a sheet gripping zone and a stationary sheet feed table adjacent thereto, a pusher for feeding a sheet along said table into said zone by engaging the trailing edge of the sheet, a register element movable along said table to engage a side edge of an advancing sheet, parallel endless conveyors entirely below said table respectively carrying said pusher and said side register element therealong, said conveyors having advancing flights extending and which move in a direction parallel to the direction of feeding of the sheet, said pusher and said side register element extending upwardly from said flights to working positions above said table, a relatively fixed cam above and at one side of said table in the path of advance of said register element to move

said element laterally into contact with the sheet, common driving means for said conveyors synchronized with the rotation of said cylinder to advance said pusher and said side register element in said direction at the surface speed of said cylinder, a normally stationary frame member supporting said cam at one side of said table, the respective conveyors having coaxial backward and forward sprockets, said frame member and the sprockets of the conveyor for said side register element each being adjustable in a direction transverse to the path of the sheet to adjust the mechanism for sheets of different size, and means interconnecting said frame member and the last mentioned sprockets for simultaneous adjusting movement.

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