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2,855,195

OPENING DEVICES FOR SIGNATURE-GATHERING MACHINES

Filed July 1, 1955

4 Sheets-Sheet 1

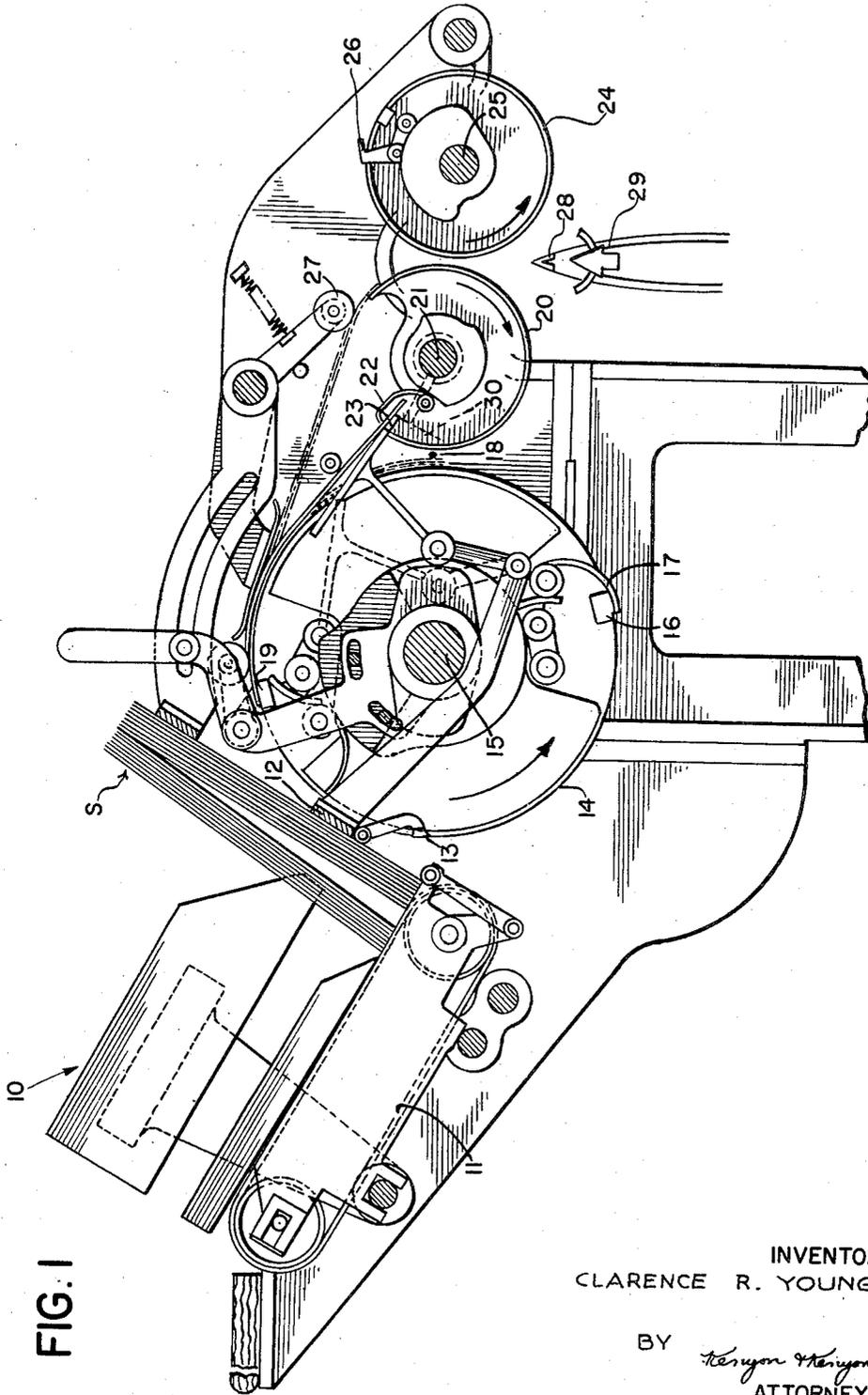


FIG. 1

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4 Sheets-Sheet 2

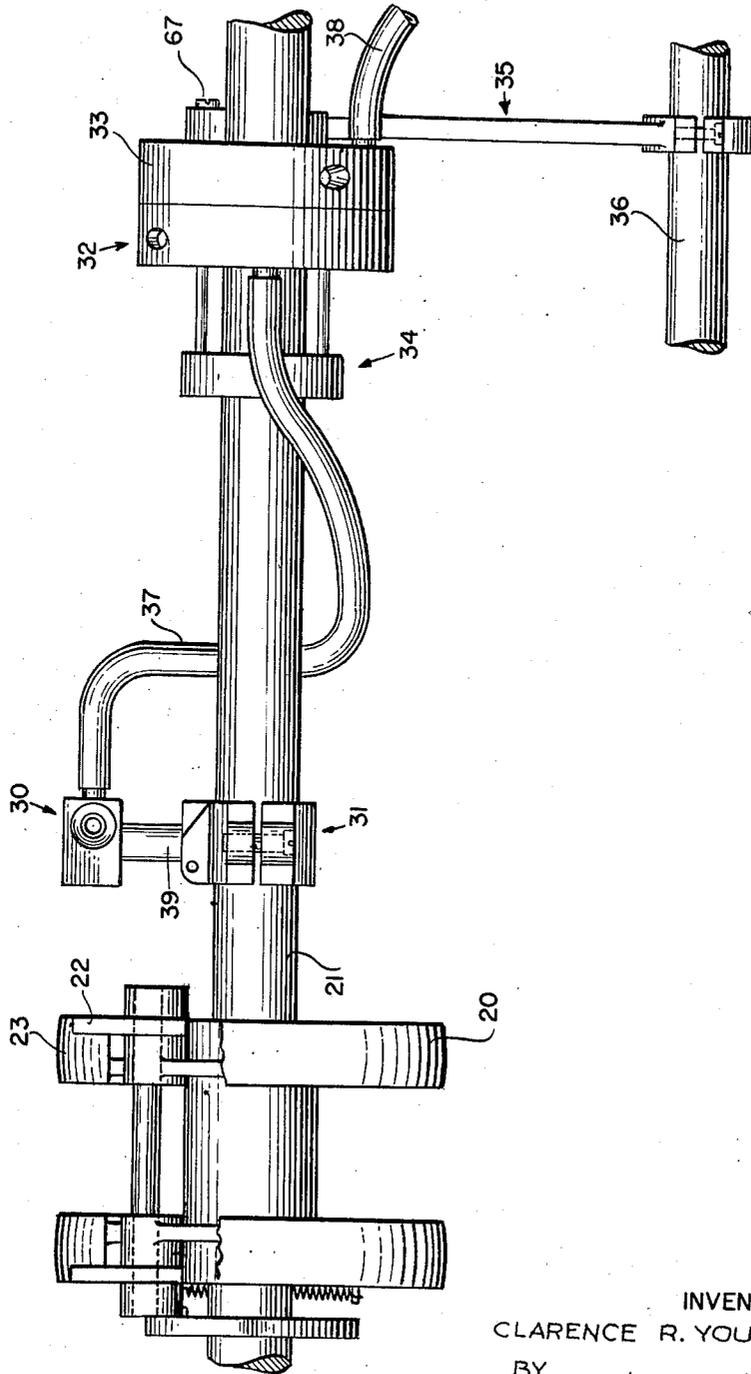


FIG. 2

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4 Sheets-Sheet 3

FIG. 4

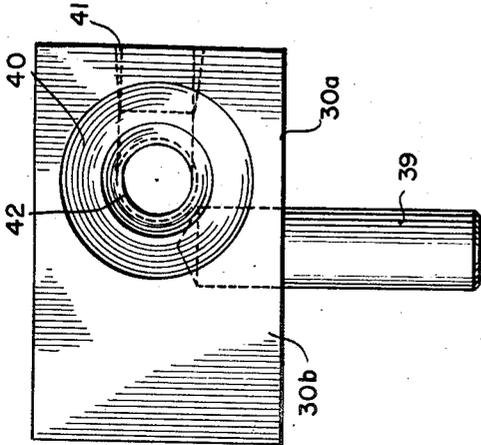


FIG. 3

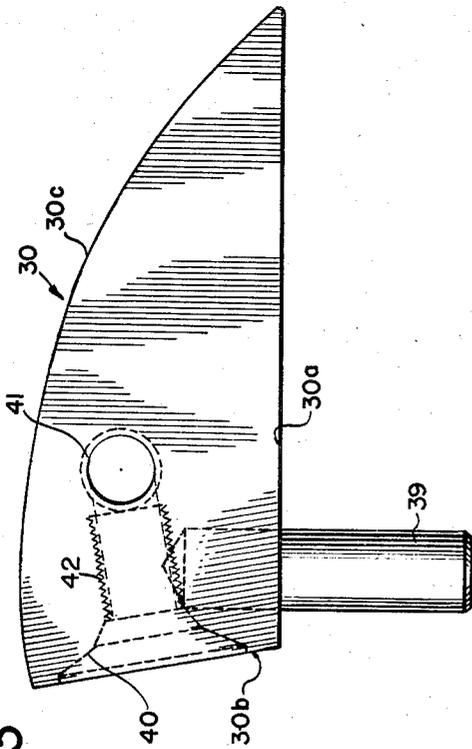


FIG. 7

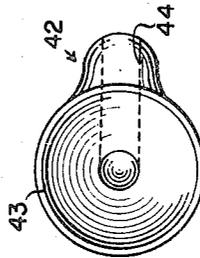


FIG. 5

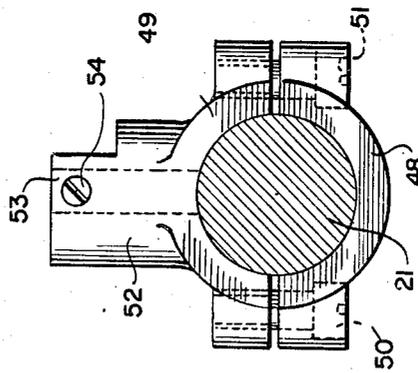
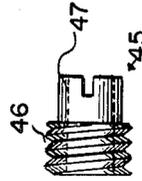


FIG. 6



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4 Sheets-Sheet 4

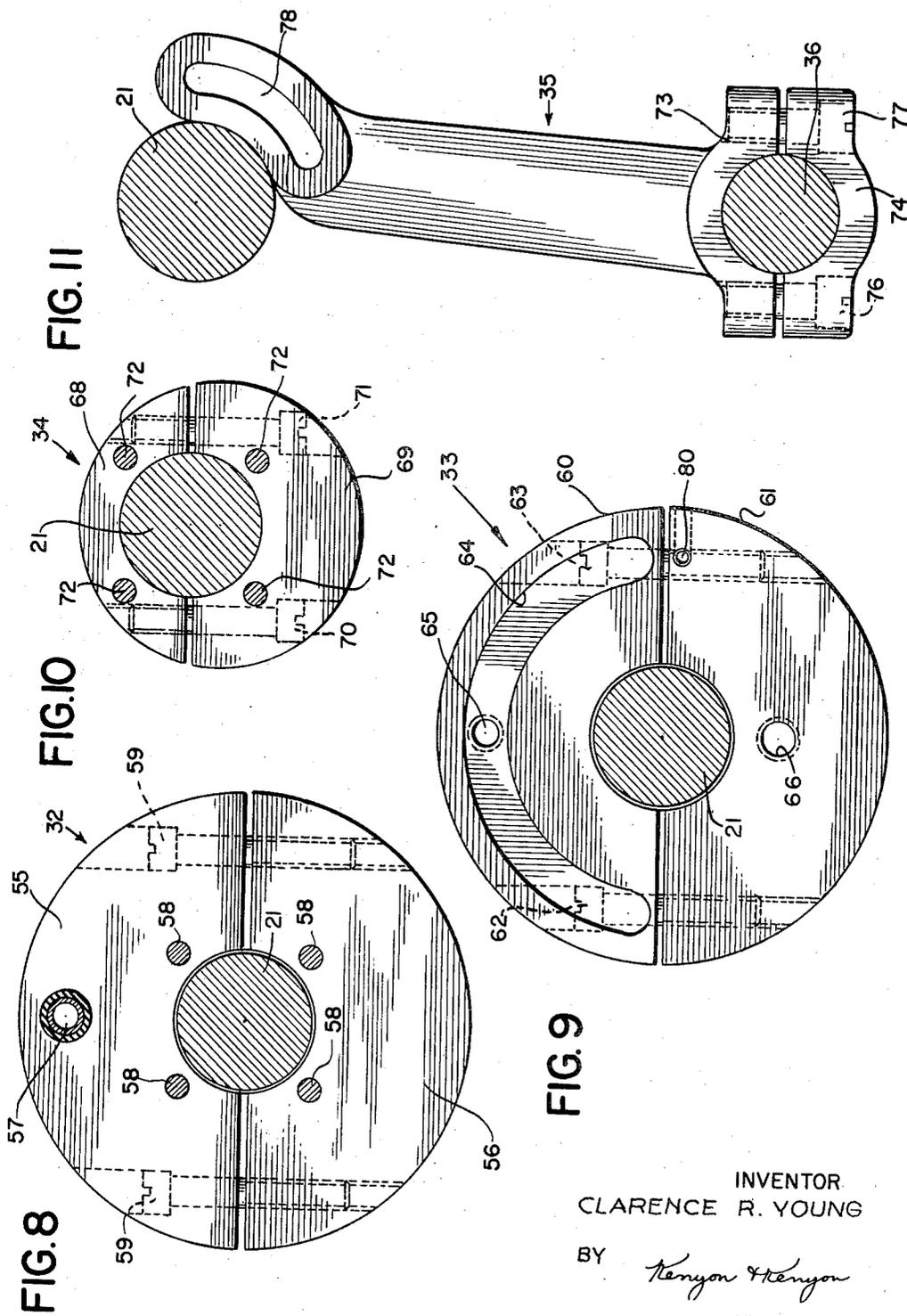


FIG. 9

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OPENING DEVICES FOR SIGNATURE-GATHERING MACHINES

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Application July 1, 1955, Serial No. 519,537

3 Claims. (Cl. 270—54)

The present invention relates generally to signature-gathering machines and more particularly to suction apparatus for opening a signature which is unlapped.

In a signature-gathering machine, signatures are extracted from each of a series of stacks and transferred to a travelling conveyer on which the successive signatures are received and grouped for eventual delivery as a procession of signature groups adapted to be suitably bound and stapled. In signature-gathering machines of the type heretofore known, the mechanism is capable only of handling lapped signatures. By lapped signatures is meant those wherei none side is long relative to the other to provide a width extension or lap by which the signatures may be opened.

Thus in the signature-gathering machine disclosed in U. S. Patent No. 2,413,358, issued December 31, 1946, the signatures are drawn directly out of a hopper against a main drum having grippers which grip the folded or binding edge of the signature. Revolving clockwise, the main drum deposits the signature against a register stop from which position the signature is transferred, opened and dropped on a false saddle by means of a transfer drum, rotating on a false saddle by means of a transfer drum, rotating counterclockwise, and an opener drum rotating clockwise. The transfer drum is provided with grippers which grip the lapped margin of the signature, transferring the signature to a position where the opener drum grips the short side. With the transfer drum still gripping the long side, the signature is opened and placed on a false saddle from which point it is advanced by a conveyer chain to a saddle stitcher for delivery.

The use of lapped signatures adds materially to the paper cost of mass-circulation publications since the lap must ultimately be trimmed off and becomes waste. Moreover, some presses cannot produce a lap in the signature. The need exists, therefore, for a gathering machine capable of handling unlapped signatures, whereby the signatures may be opened for placement on the saddle. By an unlapped signature is meant one in which the opposing sides are of equal dimension.

In view of the foregoing, it is the principal object of the invention to provide a signature-gathering machine adapted to operate on unlapped signatures.

More particularly, it is the object of the invention to provide an attachment including a suction head adapted to cooperate with the transfer drum of a gathering machine to open unlapped signatures.

Yet another object of the invention is to provide a suction head actuated by a rotary valve, which apparatus is of simple and sturdy construction and operates in an efficient and reliable manner.

For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawing, wherein like elements in the several views are identified by like reference numerals.

In the drawing:

Figure 1 is an end elevation view of a signature-gathering machine, certain longitudinal members of which are shown in section.

Figure 2 is a front elevational view of a suction apparatus including a suction head and a slide valve, in accordance with the invention, as mounted on the shaft of the transfer cylinder.

Figure 3 is a side elevational view of the sucker head of the suction apparatus.

Figure 4 is a front elevational view of said head.

Figure 5 is a front elevational view of the carrier for the suction head.

Figure 6 is a sectional view of an adaptor for the head.

Figure 7 is a perspective view of a sucker insert to be received in the adaptor.

Figure 8 is a front elevational view of the rotor of the slide valve.

Figure 9 is a front elevational view of the stator of the slide valve.

Figure 10 is a front elevational view of the collar for securing the rotor to a shaft.

Figure 11 is a front elevational view of a bracket for the stator of the valve.

Referring now to the drawings, and more particularly to Fig. 1, it is to be understood that the mechanism shown for a single stack is repeated for the several stacks of the machine.

The signatures S are shown stacked with their closed edges downward in a hopper, generally designated by numeral 10. Hopper 10 is provided with a bottom feed belt 11 and a front wall 12 against which the first signature bears. Each hopper is provided with signature detachers, each in the form of a suction cup 13 mounted on a swingable lever. For each signature stack, the extractor comprises a continuously rotatable drum 14 mounted on a shaft 15. Near its periphery, drum 14 carries a gripper seat 16 for each gripper member 17 which closes thereon with sufficient force to grip and pull out of the hopper the detached signature. The gripper seat carries the extracted signature around the drum 14 and then around and upwardly to and beyond the transfer point marked with a (*) 18. A register stop 19 is formed with a notch to receive the closed edge of the signature. Stop 19 is arranged in the path of the signatures advancing around the circumference of the drum and is so located that each advancing signature immediately after its release by the gripper comes up against the stop. The closed edge of the signature pauses at the stop 19, whereas the operable edge assumes an exact position at the front side of the drum 14 at the transfer point 18, in readiness for cooperation with the transfer means.

The transfer cylinder 20 is mounted on a shaft 21 and is arranged to rotate continuously adjacent the periphery of extractor drum 14 but in the opposite direction. To grip the operable edge of each released signature resting near transfer point 18 and for pulling the signature reversely away from the drum there is provided a main gripper 22 mounted on a rock shaft and cooperating with a seat 23.

The cylinder 20 is not, however, provided with lap gripper means as disclosed in the above-identified patent. Such means are absent inasmuch as the signature does not include a lap. The means for opening the signature is in the form of an independent attachment mounted on shaft 21, which attachment includes a suction head and a rotary valve to be later described in connection with the remaining figures. It is sufficient to know at this juncture that the suction head attaches itself to the edge of one-half of the signature and during continued motion of the transfer cylinder bends it so that the edge of the other half separate away from the attached half in time

for the opening device to engage and grip the released half.

The opening device is in the form of a cylinder 24 turning on a shaft 25 in a direction opposite to that of the transfer cylinder 20. To engage the edge of the released half of each signature, the opening cylinder is provided with a gripper 26. To ensure continued advancing travel of each signature after it has been partially or wholly released from the transfer and opener cylinders, an idler roller 27 is provided which resiliently bears against the transfer cylinder. Finally the transfer and opener cylinders entirely release the signature which is discharged downwardly to settle on saddle 28 which it is slid along to a travelling conveyor 29.

Referring now to Fig. 2, the suction apparatus in accordance with the invention is shown separately, the apparatus being mounted on rotary shaft 21 of the drum cylinder 20. The apparatus comprises a suction head 30 which is supported on a carrier 31 secured to shaft 21, a sliding valve constituted by a stator 32 freely supported on shaft 21 and a rotor 33 secured to shaft 21 for rotation therewith by means of a collar 34. Stator 32 is held against rotation by means of a bracket 35 clamped on a tie rod 36. The suction head is coupled to the rotor 33 by means of a flexible hose 37, and the stator 32 is coupled to a suitable vacuum pump (not shown) by means of a flexible hose 38.

As shown in Figs. 3 and 4, the suction head 30 is formed by a block having a flat bottom wall 30a, a flat front face 30b slightly inclined with respect to the bottom wall and a curved top wall 30c. The curvature of the top wall corresponds to the curvature of the transfer cylinder 20, the suction head 30 being mounted on carrier 31 by means of a post 39 extending perpendicularly from the bottom wall of the head and received within socket formed in carrier 31.

The suction head 30 is spaced from shaft 21 by means of post 39 and occupies a position such that the face 30b thereof is aligned with the gripper seat 23 on the transfer cylinder 20 and the top surface 30c is aligned with the periphery of the transfer cylinder. Formed in the front face 30b of the suction head in a conical mouth 40 which communicates with a lateral opening 41 in the head through a cylindrical passage 42 which is internally threaded.

The lateral opening 41 represents the intake of the suction head and is connected, as shown in Fig. 2, to the sliding valve by means of pipe 37. In the event it is desired to use a flexible sucker, such as funnel-shape sucker 42 shown in Fig. 7, which may be fabricated of rubber or a similar material and which includes a conical mouth 43 and a cylindrical stem 44, an adaptor 45 is provided such as is shown in Fig. 6. Adaptor 45 includes an externally threaded ring portion 46 which is threadably received in passage 42 of the suction head and a sleeve 47 which is insertable into the stem 44 of the sucker.

As best seen in Fig. 5, the sucker head carrier for mounting head 30 on shaft 21 is constituted by two complementary sections 48 and 49 having arcuate portions surrounding shaft 21 and provided on either side with lateral wings to receive screws 50 and 51, whereby the carrier may be clamped securely onto the shaft 21. The upper segment 49 of the carrier is provided with a projection 52 having a longitudinal socket 53 for receiving the lower end of the post 39 of the suction head. A set screw 54 is provided which extends into socket 53 to engage post 39 and to maintain the same at an adjusted position therein.

The rotor element 33 of the sliding valve, as best seen in Fig. 8, is constituted by two semicircular segments 55 and 56 of an annular plate, the upper segment 55 being provided with an orifice 57 which is connected at the front end through hose 37 to the suction head 30. Circumferentially arranged about the shaft opening in the

annular plate are four bores 58, two on each segment, which are internally threaded to receive the supporting rods 72 extending from the collar 34 to be later described. The two segments 55 and 56 of the rotor 32 are held together by studs 58 and 59 which threadedly interconnect said segments.

The stator element 33 of the sliding valve is constituted by two semicircular segments 60 and 61 of an annular plate having the same diameter as the rotor, which segments are clamped together by means of studs 62 and 63. The upper segment 60 is provided with an arcuate groove 64 extending through an arc of substantially 180°, the radial position of said arc corresponding to that of orifice 57 in the rotor, whereby when the rotor and the stator are in sliding engagement on shaft 21, orifice 57 communicates with groove 64 when in registration therewith. On the lower segment 61 is a bleed hole 80 adjacent the extremity of groove 64, whereby when orifice 57 in the rotor registers therewith, the vacuum in the suction head is released.

The stator is further provided with an intake opening 65 connected to pipe 38 leading to the suction pump and communicating with groove 64. The lower segment 61 is provided with a threaded bore 66 which receives a bolt 67 (note Fig. 2) for attaching bracket 35 to stator 33. The central opening in the annular ring forming the stator has a diameter exceeding that of shaft 21 whereby the stator is supported freely thereon, the stator position being fixed by means of bracket 35 which connects to tie rod 36.

To secure rotor 32 to shaft 21 for rotation therewith, the collar 34, as shown separately in Fig. 10, is constituted by an annular plate having an eccentric hole and upper and lower segments 68 and 69, the segments being held together and clamped to shaft 21 by means of studs 70 and 71. Projecting perpendicularly from the upper and lower segments are four rods 72 which are received in bores 58 in the rotor, thus securing the rotor to the shaft.

The bracket 35, as shown separately in Fig. 11, is constituted by a carrier including upper and lower segments 73 and 74 which are clamped on tie rod 36 by means of bolts 76 and 77, the arm of the bracket including an arcuate slot 78 through which bolt 67 is inserted to threadedly engage stator 33. Bolt 67 may be so positioned within slot 78 as to permit relative adjustment of said stator with respect to said bracket.

In operation, the suction head is coupled to the suction pump through the sliding valve for about one-half the period of each rotation of the transfer cylinder shaft, the suction thereafter being relieved through the bleed hole 80. The suction head 30 takes its gripping action on one-half of the signature at the same time the main gripper 22 engages each signature or at least before the main gripper retracts for release of the other half of the signature, which occurs immediately in advance of the engagement of said other half by the gripper 26 of the opening device. The suction head 30 remains active until the signature has been well opened and is about to be discharged upon the conveyor saddle, at which time both the opening gripper and the suction are released for the complete discharge of the signature.

While there has been shown what is considered at present to be a preferred embodiment of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential nature of the invention. It is intended therefore in the appended claims to cover all such changes and modifications as fall within the true spirit of the invention.

What is claimed is:

1. In a signature-gathering machine, a transfer cylinder mounted on a shaft and provided with gripper means to engage each signature by its operable edge and to transfer it around for opening and discharge, said gripping means being constituted by a seat disposed radially relative to

5

the cylinder and facing in the direction of rotation and a pivoted gripper to grip the entire thickness of the signature against said seat; and apparatus for holding one-half of said signature whereby upon release of said gripper the other half separates from said held half, said apparatus comprising a suction head having a top surface whose curvature conforms to the periphery of said cylinder and a flat front face having an inclination corresponding to the radial position of said cylinder seat, said face having a suction mouth adapted to engage one-half of said gripped signature, carrier means for securing said head to said shaft at a position wherein said top surface and said face are aligned respectively with said periphery and said seat of said cylinder, timing valve means to apply suction to said head for a predetermined interval in the course of each rotation of said shaft, and means coupling said valve means to a suction source.

2. In a signature-gathering machine, a transfer cylinder mounted on a shaft and provided with gripper means to engage each signature by its operable edge and to transfer it around for opening and discharge, said gripping means being constituted by a seat disposed radially relative to the cylinder and facing in the direction of rotation and a pivoted gripper to grip the entire thickness of the signature against said seat; and apparatus for holding one-half of said signature whereby upon release of said gripper the other half separates from said held half, said apparatus comprising a suction head having a top surface whose curvature conforms to the periphery of said cylinder and a flat front face having an inclination corresponding to the radial position of said cylinder seat, said face having a suction mouth to attach one-half of said gripper signature against said face, carrier means for securing said head to said shaft, a sliding valve mounted about said shaft and connected to said suction head to evacuate same for a predetermined period in the course of a shaft revolution, said sliding valve comprising a rotor secured to said shaft and a stator freely mounted on said shaft and held at a fixed position, said rotor having an orifice coupled to the mouth in said suction head, said stator having an arcuate slot in radial registration with said orifice, and means to couple said slot to a suction source.

3. In an insert signature gatherer, a continuously rotary drum for carrying unclapped signatures, a transfer cylinder

6

mounted on a shaft parallel to said drum, the drum being adapted to release each signature at a predetermined signature pausing position and having means to register the released signature in such predetermined pausing position with its openable edge at a transfer point in front of the drum, the cylinder having gripping means constituted by a main gripper and a seat adapted to engage and grip each pausing signature by its openable edge and transfer it around for opening and discharge; said cylinder having means to rotate it in a direction to pull the signature from the drum successively upwardly and thence over and around frontwardly and downwardly toward a front discharge point; said seat being substantially radial to the cylinder and facing in the direction of rotation and thereby adapted to enter the space between signature and drum; said gripper means being mounted swingably on the cylinder at a pivot point inwards of the seat and adapted to grip against the seat the entire thickness of the signature; and apparatus mounted on said shaft for holding one-half of the signature whereby the other half may be separated therefrom upon release of said gripper, said apparatus comprising a suction head mounted on said shaft adjacent said cylinder and having a front face in alignment with said radial seat, a top surface whose curvature conforms to the periphery of said transfer cylinder, said face having a suction mouth therein adapted to engage said one half of said signature carrier means for securing said head to said shaft at a position wherein said top surface and said face are aligned respectively with said periphery and said seat of said cylinder, timing valve means to apply suction to said head for a predetermined interval in the course of each rotation of said shaft, and means coupling said valve means to a suction source.

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