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W. PECHY

2,392,403

SHEET SEPARATING AND FEEDING MECHANISM

Filed July 22, 1943

2 Sheets-Sheet 1

Fig. 1

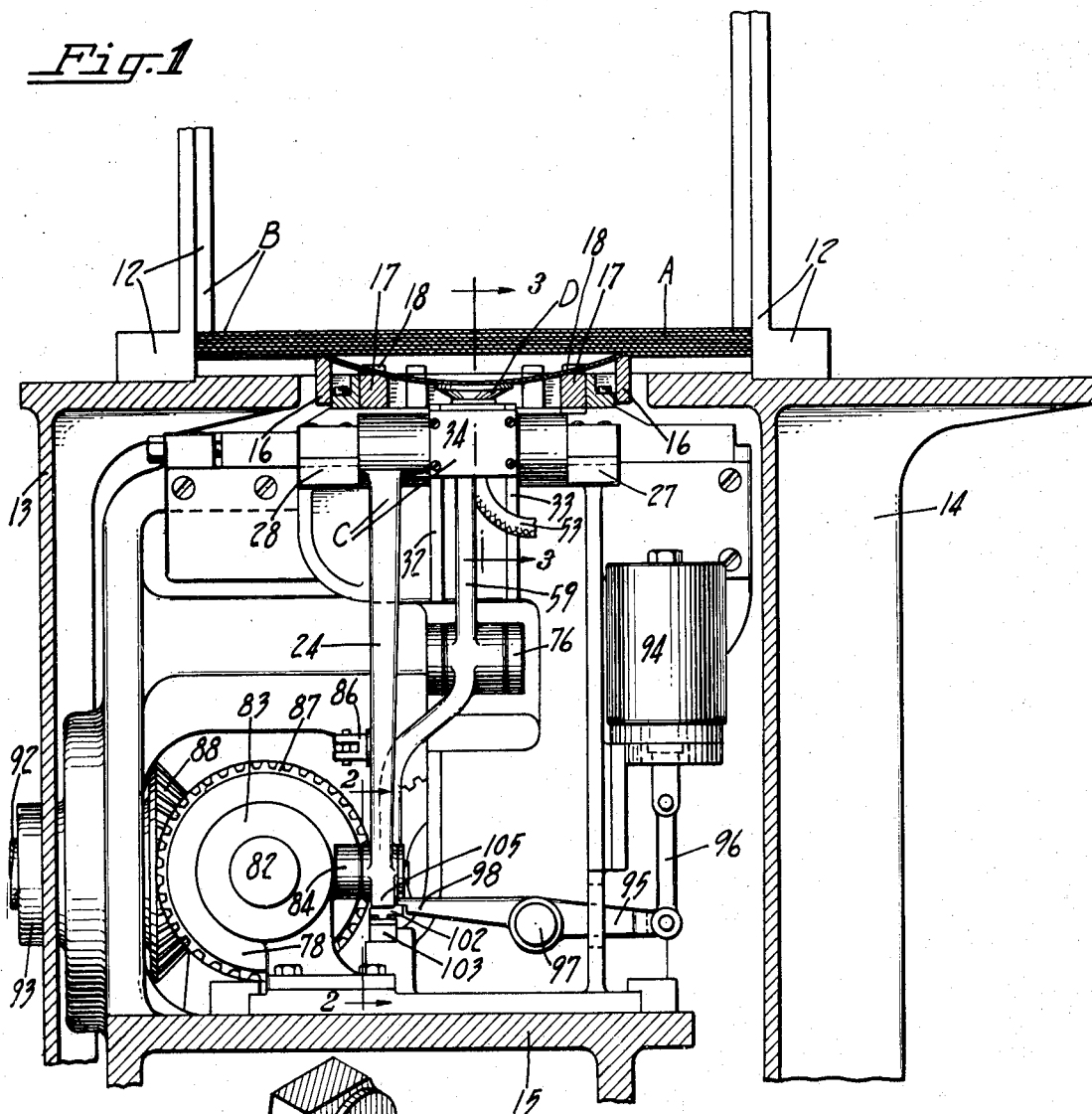


Fig. 2

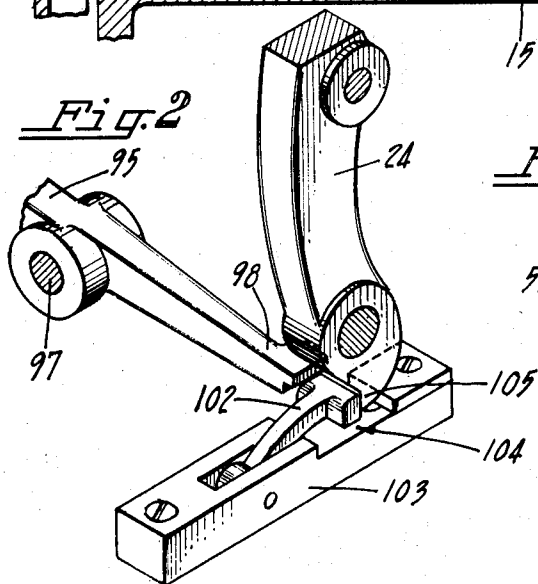
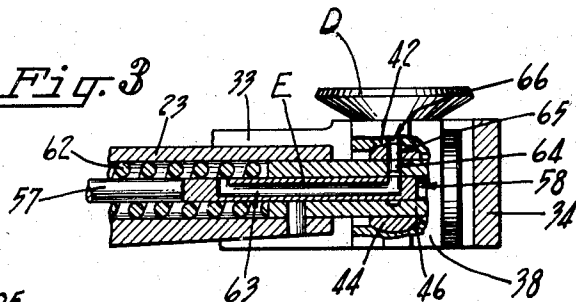


Fig. 3



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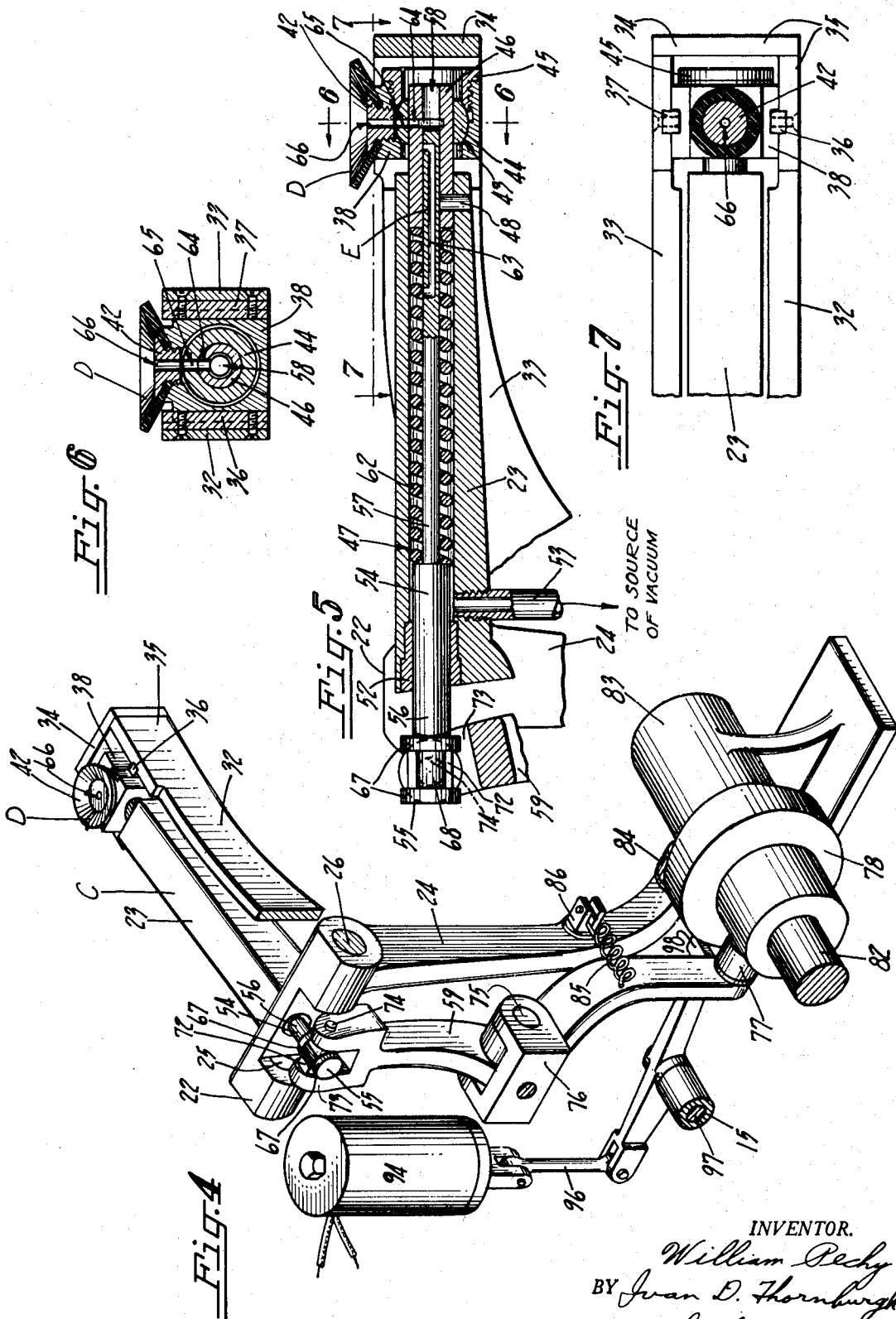
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SHEET SEPARATING AND FEEDING MECHANISM

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2 Sheets-Sheet 2



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SHEET SEPARATING AND FEEDING MECHANISM

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8 Claims. (Cl. 271-32)

This invention relates to mechanism for separating and feeding material sheets from which container parts are made and has particular reference to a controlled suction cup carried on a swinging arm so that the engaging surface of the cup at all times is parallel to the surface of the sheets within a magazine.

In the feeding of sheets or blanks from a supply magazine into a can making machine for example, the sheets usually are separated by suction cups which engage the surface of the outermost sheet in the stack and such cups are carried on swinging arms or levers which by reason of their required arcuate path of movement cannot be depended on to cause the cups to engage the sheets uniformly.

The instant invention contemplates overcoming such difficulties by providing a controlled floating suction cup carried on a swinging arm, which always engages the surface of the sheet uniformly for the entire periphery of the cup thereby increasing its holding or gripping power and maintaining the same while shifting the blank to some other plane or level.

An object of the invention is the provision of a sheet or container blank separating mechanism wherein a sheet or blank is separated from a stack of sheets or blanks in a supply magazine by a yieldable floating suction cup which is maintained in a desired position throughout its movements to insure parallel engagement of the suction cup with a surface of the sheet or blank.

Another object is the provision in such a mechanism having a floating suction cup carried on an actuated lever or swinging arm, of devices for controlling the position of the suction cup so that it will engage a flat sheet or blank normal to the surface thereof, to grip and flex the sheet or blank preparatory to separating it from a supply of blanks.

A further object is the provision in a separating and feeding mechanism of a valve carried in a swinging arm which operates simultaneously with the movement of a floating suction cup on the arm, to connect a source of vacuum with the cup for gripping a sheet to break the vacuum for releasing its hold on the sheet, this being in timed relation with the action of strip-off fingers in a can making machine.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is an elevation in section through a

machine showing a mechanism embodying the present invention;

Fig. 2 is an enlarged perspective section taken substantially along a plane 2-2 in Fig. 1 and showing a locking device, parts broken away, parts in section;

Fig. 3 is an enlarged fragmentary section of an automatically operated suction cup mechanism as viewed substantially along the broken lines 3-3 in Fig. 1;

Fig. 4 is an enlarged perspective view showing the automatically operated suction cup mechanism, parts broken away, parts in section;

Fig. 5 is a sectional view similar to Fig. 3 showing the parts in a different position with other parts added;

Fig. 6 is a transverse sectional view taken substantially along the line 6-6 in Fig. 5; and

Fig. 7 is a top plan view taken substantially along the line 7-7 in Fig. 5 with parts in section.

As a preferred embodiment of the invention the drawings illustrate a sheet or blank separating and feeding mechanism. Figure 1 shows this mechanism located near the feed-in end of a machine, the principal parts of which are illustrated. This machine may be of the character disclosed in the United States Patent No. 1,875,353, issued September 6, 1932, to John F. Peters, on Can body maker.

In the operation of the machine substantially flat sheets or container blanks are fed individually from a stack of sheets or blanks in a magazine by a separating and feeding mechanism for delivery to a subsequent work station or other convenient place of deposit. This separating and feeding mechanism preferably operates in time with other moving parts of the machine. In this invention a floating suction cup is utilized to move into engagement with the lowermost sheet or blank in the magazine, for drawing it down into a bowed position, as illustrated in Fig. 1. With the sheet or blank in this position it then is ready to be stripped from the suction cup by any suitable means, thus separating it from the stack preparatory to subsequent feeding.

In the instant machine, a stack of sheets or blanks A is disposed in a magazine B over a separating and feeding mechanism C (Fig. 1). This magazine includes guide posts 12 which are secured at their lower ends to side frames 13, 14. These frames comprise part of a machine main frame 15. The stack of sheets or blanks A in the magazine is supported on spaced parallel bars 16 which are mounted on the machine main frame 15 and extend inwardly thereof from the end of the machine.

When the lowermost sheet or blank A in the stack has been drawn down by a suction cup D into a bowed position at its center (Fig. 1), it is against sheet or blank feed bars 17. There are two such bars, one being spaced on each side of the suction cup D. Each of these bars carries feed fingers 18 which operate during the movement of the feed bars to strip the bowed blank free from the suction cup.

The separating and feeding mechanism C (Fig. 4) includes a bell crank lever shaped member 22, having a laterally extended arm 23 and a depending or rocker arm 24. This member is carried on studs 25, 26 mounted in bearings 27, 28 (Fig. 1) of the main frame. The mechanism C is located at the feed-in end of the machine hereinbefore mentioned, so that the automatically operated suction cup D is centrally of and is directly beneath the stack magazine B.

The arm 23 of the mechanism is rocked between stationary arms or brackets 32, 33 which latter extend outwardly as integral parts of the main frame. These arms are connected at their outer ends by an end plate 34 which is secured to each arm (Figs. 1, 4 and 7), thus forming a stationary yoke 35.

Each of the stationary arms 32, 33 of the yoke carry feathers 36, 37 (Figs. 4, 6 and 7) which are secured in vertically disposed slots in these arms for guiding a slide piece or member 38. This slide piece is moved up and down by the arm 23 for effecting the movement of the suction cup D.

The suction cup D is conical in shape having the peripheral edge or rim in a substantially horizontal plane. The cup is made of resilient material such as rubber or the like. The cup D is mounted on a tapered seat in the upper part of the slide piece 38 and is held to the desired conical shape by a screw or angularly shaped plug 42 (Figs. 5 and 6).

The central part of the slide piece 38 is hollowed and is provided with a seat 43 for a ball-like element 44. This forms a ball and socket or universal joint which imparts flexibility between the parts. The ball element 44 is retained in the seat 43 of the slide piece 38 by a hollowed screw element 45.

The ball element is carried on a sleeve 46 which is secured in a longitudinal bore 47 of the arm 23 (Fig. 5) by a pin as at 48. This ball element is free to slide along the sleeve 46 as the arm 23 is swung up and down, as during a separating operation. This sliding connection compensates for the arcuate path traveled by the end of the arm. The suction cup D during the swinging of the arm 23, is raised and lowered along a vertical path and thus is maintained normal to the surface of a sheet or blank in the magazine.

The longitudinal bore 47 of the arm 23 is closed in part at one end by the sleeve 46 and at the other end by a bushing 52 (Fig. 5). This forms a suction chamber in the arm which is utilized in with-drawing air from the suction cup. This chamber may be connected to suitable vacuum source as by means of a pipe connection 53.

In order to control the vacuum supply to the cup D, a valve E is employed and is operated in the suction chamber in time with the movements of the swinging arm. This valve includes a valve element 54 operative in the sleeve 46. The valve element comprises a head 55, an intermediate part 56 and a stem 57. The intermediate part slides in the bushing 52 and the stem moves in

the central opening of the sleeve 46 which thus provides a valve seat 58.

The valve element 54 is operated by a rocker arm 59 having a connection with the head 55. The valve element is maintained in a normally closed position by a spring 62 which is located in the chamber 47 and which surrounds the stem 57. An air passage or port 63 (Fig. 5) is cut in the end of the valve stem and communicates with the suction chamber at one end and in the closed position of the valve is sealed off by the wall of the valve seat 58 at the other end.

When the swinging arm 23 is raised for lifting the suction cup D up to an engaging position with a sheet A in the stack magazine, the valve element 54 is moved simultaneously to the right, as viewed in Fig. 3, to an open position. In this position the air passage 63 at one end is in registration with an opening 64 in the sleeve 46. Such an opening may include an annular channel cut in the inside wall of the sleeve. The opening 64 is in registration with a port 65 formed in the ball element 44 and a bore 66 extending through the plug 42. In this manner communication is established between the suction chamber and the suction cup. Thus suction is on the cup when it engages the surface of the sheet A.

The valve E is kept in its open position (Fig. 3) as the arm 23 swings down and the suction cup continues its grip on the sheet A while drawing the sheet into a bowed position (Fig. 1). After a sheet A is in this bowed position the valve stem moves to the left, as viewed in Fig. 5, and this closes the valve and shuts off the cup from the vacuum source. As the valve element continues moving, the terminal end of the stem 57 gradually uncovers the opening 64 in the sleeve whereupon air enters through the openings 58, 65, 66, in the parts 46, 44 and 42 (Fig. 5) thus breaking the cup hold on the sheet.

The closing of the valve E and the breaking of the vacuum in the suction cup D preferably is timed with the movement of the feed bars 17 to facilitate stripping the bowed sheet or blank free of the suction cup D while moving it from beneath the stack magazine. The valve E then remains closed until the arm 23 again is raised for engaging another sheet or blank preparatory to gripping and bowing it, when the cycle of operation is repeated.

The head 55 includes a pair of spaced collars 67 having a reduced section 68 of desired shape therebetween. Connecting bearing blocks 72 engage the section 68 on opposite sides and are carried in an upper forked end 73 of the rocker arm 59 on studs 74 (Figs. 4 and 5).

The rocker arm 59 oscillates on studs 75 anchored in a bracket 76 which is mounted on the main frame (Figs. 1 and 4). The lower end of the arm 59 carries a cam roller 77 which cooperates with one face of a cam 78 mounted on a shaft 82 journaled in bearing 83 carried on the main frame.

The arm 24 of the lever 22 carries a cam roller 84 at its lower end. This roller cooperates with an opposite face of the cam 78. This cam is a double face cam which simultaneously operates the valve in time with the swinging arm. The roller 84 is retained in contact with the cam face by means of a spring 85 having one end hooked to the machine main frame and the other to a fork connection 86 carried on the arm 24. The spring 62 (Fig. 5) hereinbefore mentioned, by its action keeps the roller 77 in contact with the cam 78.

The shaft 82 (Fig. 1) carries a bevel gear 87 which meshes with a bevel gear 88 mounted on a main drive shaft 92 carried in bearing 93 of the frame 13. The shaft 92 may be driven in any convenient manner.

Provision has been made in the instant invention to stop the feeding of sheets or blanks in the event of abnormal working conditions such as a jam which may occur in the machine or in an adjoining machine. For this purpose an electrically operated solenoid 94 is provided. This solenoid may be operated through suitable lead wires by a series of electrical stops or other detecting devices which will stop further feeding of sheets or blanks.

The solenoid 94 is connected in a normally closed circuit, which under normal operating conditions permits the mechanism C to function. If for any reason the solenoid circuit is opened, the solenoid is deenergized and the rocker arm 24 of the lever 22 is locked in an inoperative position (Fig. 2).

Under normal operating conditions when the solenoid 94 is energized, the forked end of a lever 95 is drawn up by the solenoid through a link 96. This lever is carried on a stud 97 mounted on the main frame. The opposite end of the lever 95 as at 98 engages against a depressible locking finger 102 carried in a bracket 103 mounted on the main frame. The end 98 of the lever 95 thus holds the finger down in a recess 104 of the bracket and permits the rocker arm 24 to operate.

In the event of a jam or stopping of the machine, the solenoid 94 is deenergized and the forked end of the lever 95 drops down and the end 98 is raised (Fig. 2). This permits the locking finger 102 to spring up and engage against a lug 105 at the lower end of the rocker arm 24, as the arm moves into the path of the finger 102 during the next lifting stroke of the swinging arm 23. The locking finger 102 then holds the rocker arm 24 back in an inoperative position against the spring 85, thus preventing the cam roller 84 from engaging against the double face cam 78 to function therewith. The separating mechanism C then is locked in this stopped condition and remains so until the solenoid 94 is again energized to depress the locking finger 102 out of the path of movement of the rocker arm 24.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke having a pair of spaced parallel arms located adjacent said magazine, an arm movable between the arms of said yoke, a slide member mounted on said arm between the arms of said yoke and having straight sliding movement toward and away from said magazine, means carried by said slide member for engaging and separating a said sheet from the stack of sheets within the magazine, an apertured universal joint interposed between said arm and said slide member for insuring flexible action therebetween, and devices carried by said yoke for

guiding said slide member during its movement by said arm toward said magazine to maintain an engaging surface of said engaging means parallel to the surface of the sheet so engaged.

2. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke located adjacent said magazine, a slide member mounted between the arms of said yoke and having straight sliding movement toward and away from said magazine, a suction cup secured to said slide member and movable therewith for engaging a said sheet in the stack of sheets within the magazine, a swinging arm located between the arms of said yoke extending through said slide member and having a universal joint connection therewith for moving the slide member while maintaining the face of said suction cup parallel to the surface of the sheet being engaged, there being communicating suction passages formed in said swinging arm and said slide member connected to a source of vacuum for energizing said suction cup when it engages said sheet.

3. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke located adjacent said magazine, a slide member mounted between the arms of said yoke and having straight sliding movement toward and away from said magazine, a suction cup secured to said slide member and movable therewith for engaging a said sheet in the stack of sheets within the magazine, a swinging arm located between the arms of said yoke and extending through said slide member for moving the latter while maintaining the face of said suction cup parallel to the surface of the sheet being engaged, an apertured ball and socket joint interposed between said arm and said slide member for insuring flexible action between the parts, there being communicating suction passages formed in said swinging arm and said slide member passing through said ball and socket joint, and a vacuum valve carried in said arm and utilizing said suction passages for effecting a vacuum condition in said suction cup and for breaking the suction therein.

4. In a mechanism for separating an individual sheet from a stack of sheets in a magazine, the combination of a stationary yoke having a pair of spaced supporting arms located adjacent said magazine, a swinging arm movable between the arms of said yoke and having a hollow section providing a suction chamber, a vacuum valve located within said chamber, a slide member having a suction cup carried thereon for engaging a sheet within the magazine, said slide member being mounted on and slidable along said arm while being guided by the said yoke for aligning the suction cup normal to the surface of a said sheet preparatory to engaging the sheet within the magazine, and means for operating said valve to connect said cup with the suction chamber for gripping the surface of a sheet so engaged.

5. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke having a pair of spaced supporting arms located adjacent said magazine, an arm movable between the arms of said yoke, a slide member mounted on said arm between the arms of said yoke and having straight sliding movement toward and away from said magazine, a suction cup carried by said slide member for engaging a sheet in said magazine, an apertured ball and socket joint interposed between said

arm and said slide member for insuring flexible action between the parts, and devices carried by said yoke for guiding said slide member during its movement with the arm and for flexing said joint to maintain the face of the suction cup parallel with the surface of the sheet being engaged.

6. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke having a pair of spaced supporting arms located adjacent said magazine, an arm movable between the arms of said yoke, a slide member mounted on said arm between the arms of said yoke and having straight sliding movement toward and away from said magazine, a suction cup carried by said slide member for engaging a sheet in said magazine, an apertured ball and socket joint interposed between said arm and said slide member for giving flexible action to the parts, a vacuum valve carried in said arm for controlling the passage of air through said joint and to and from the suction cup during the movement of said arm, devices carried by said yoke for guiding said slide member during its movement with said arm to maintain the face of the suction cup parallel to the surface of a sheet within the magazine, and means for operating said valve to vacuumize said suction cup when it first engages the sheet and to break the vacuum when the engaged sheet has been separated from said magazine.

7. In a mechanism for separating and feeding an individual sheet from a stack of sheets in a magazine, the combination of a stationary yoke having a pair of spaced supporting arms located adjacent said magazine, a swinging arm movable between the arms of said yoke and having a hollow section providing a suction chamber, a valve

located in the said suction chamber, a slide member mounted on said arm between the arms of said yoke and having straight sliding movement toward and away from said magazine, a suction cup carried by said slide member for engaging and bowing a said sheet, devices carried by said yoke for guiding said slide member during its movement by said arm to maintain the said suction cup normal to the surface of the sheet preparatory to its engagement, said valve and said slide member having air passages for communication between said suction chamber and said suction cup, means for operating the said valve to bring the said passages into registration whereby the suction cup grips the engaged sheet and bows it, and feed means located adjacent said sheet magazine for stripping the bowed sheet from said suction cup to separate it from the said magazine.

8. A mechanism for separating an individual sheet from a stack of sheets in a magazine, comprising a stationary yoke located adjacent said magazine, an arm movable within said yoke, a floating suction cup carried by said arm and having a sheet engaging face for engaging a sheet within the magazine, devices carried by said yoke for guiding said floating cup during its movement toward said magazine so that its engaging face at such time is parallel to the surface of a sheet within the magazine, a vacuum valve carried in said arm for controlling the vacuum in said floating cup, and stop devices operable in the event of abnormal working conditions for preventing movement of the said arm without terminating said valve operations.

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