Dec. 11, 1923. 1,477,240

W. CAMERON

AUTOMATIC DIE PRESS

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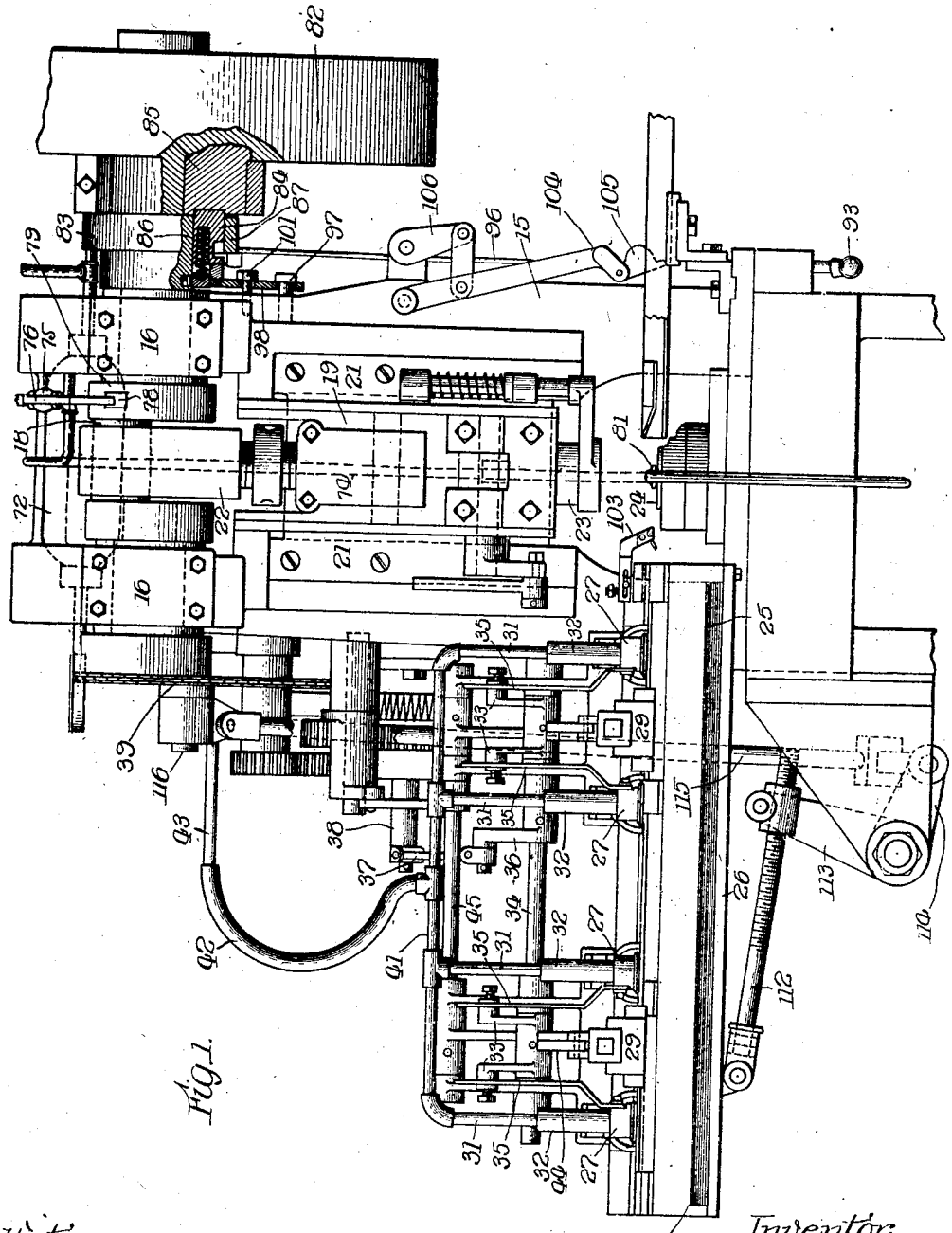


Fig. 1.

Witness:

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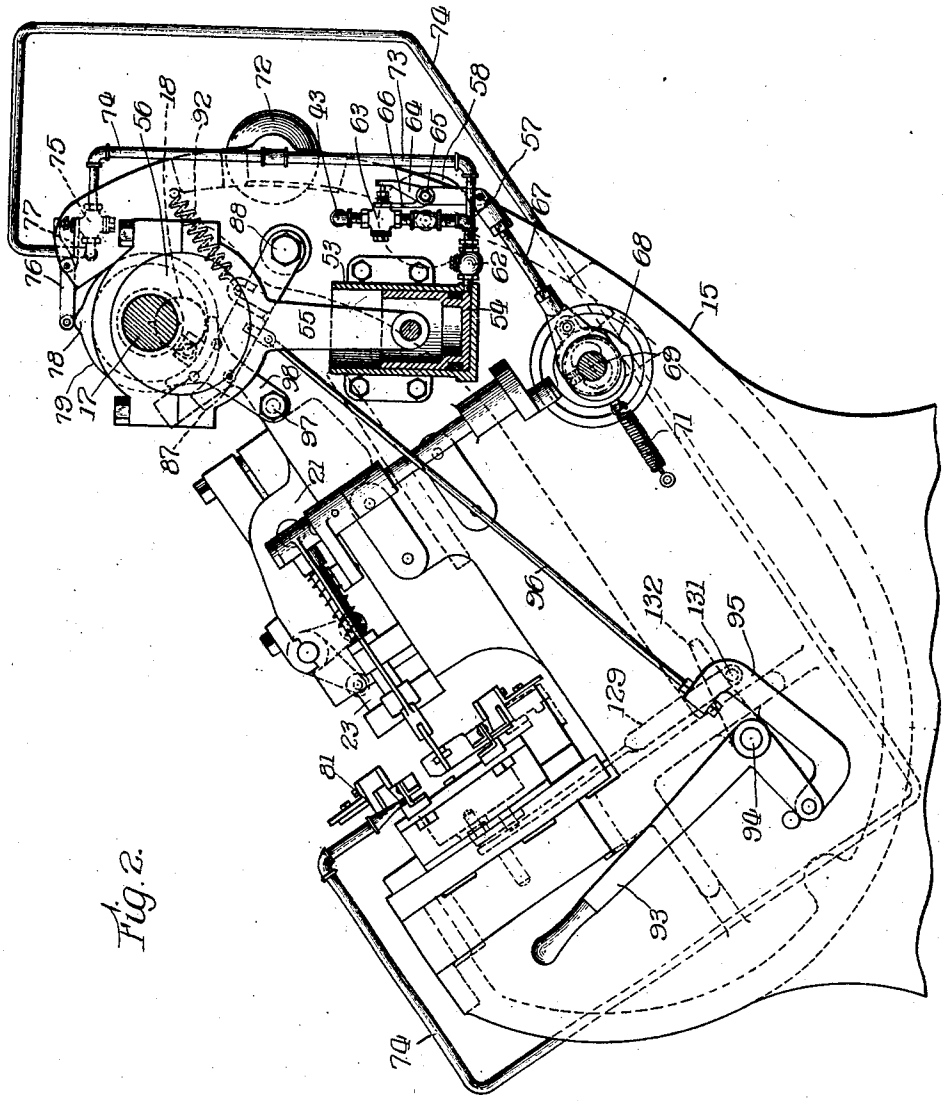


Fig. 2.

Witness:
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Fig. 3.

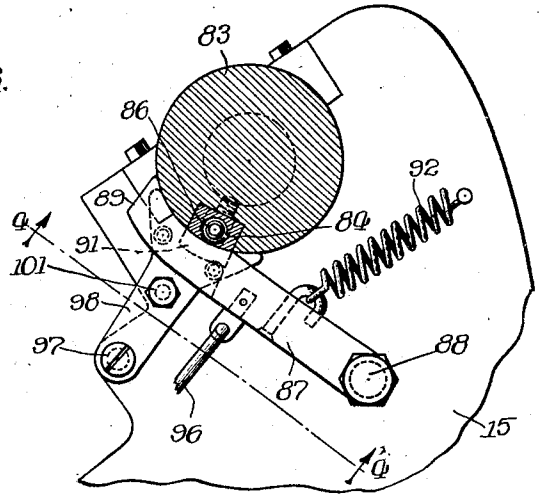


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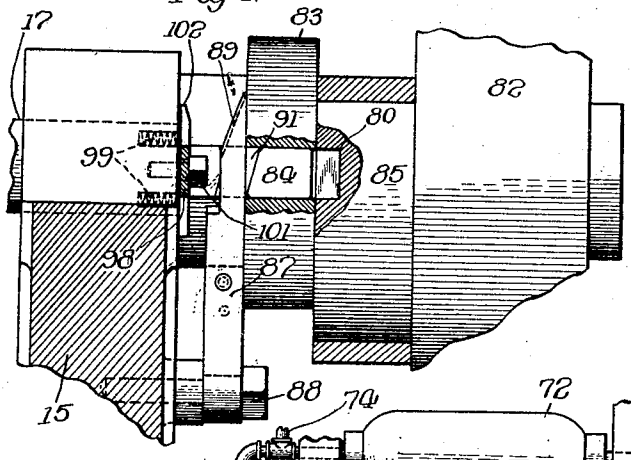
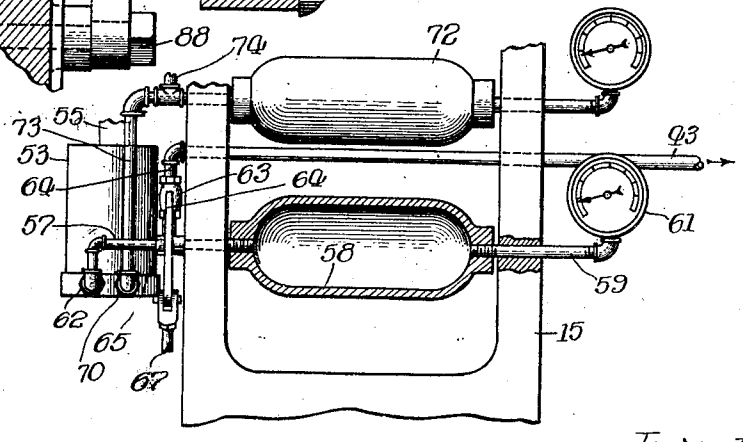


Fig. 5.



Witness:

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Fig. 6.

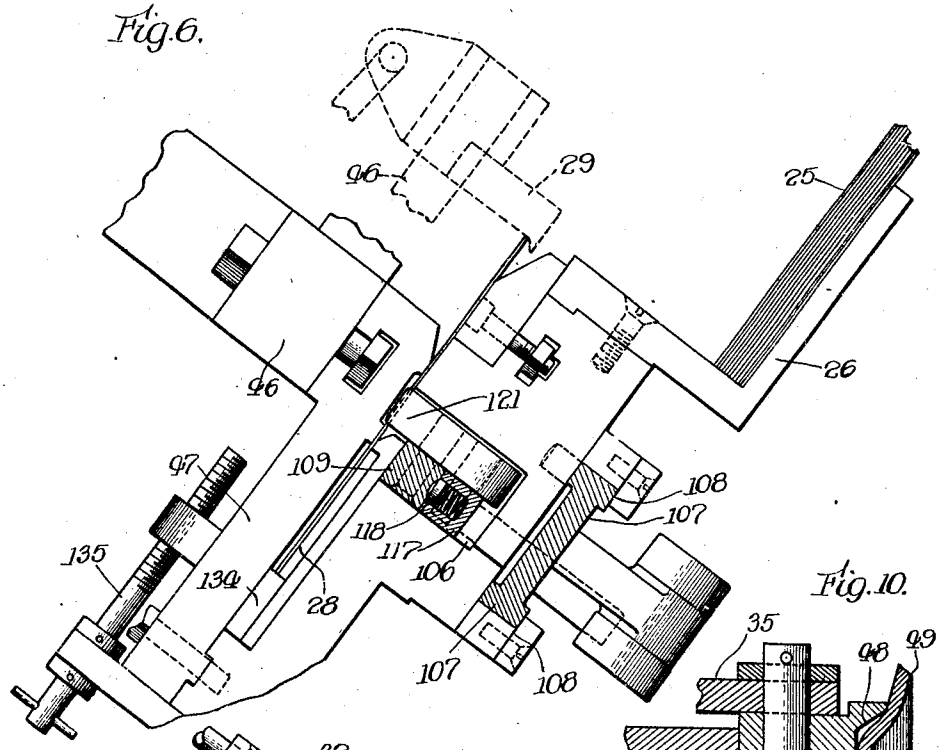


Fig. 7.

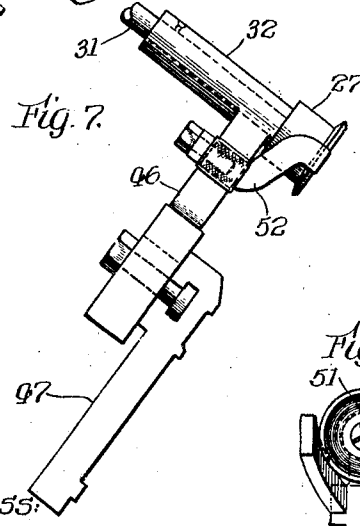


Fig. 10.

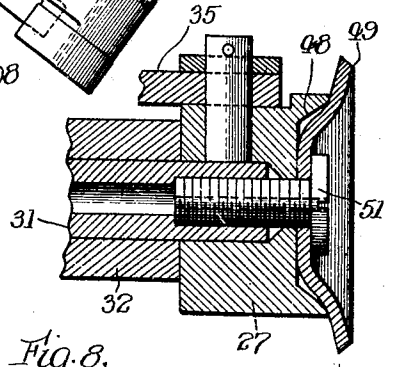


Fig. 8.

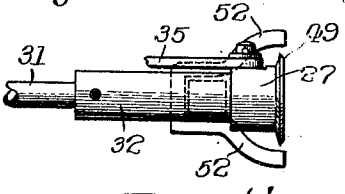
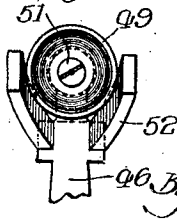


Fig. 9.



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Fig. 11.

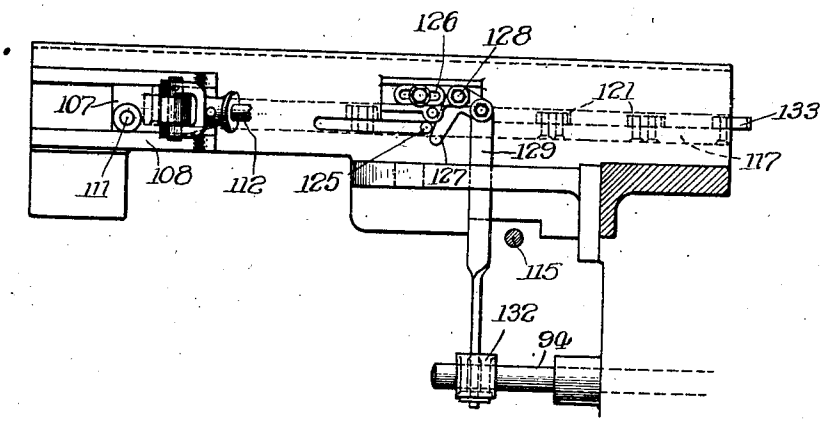


Fig. 12.

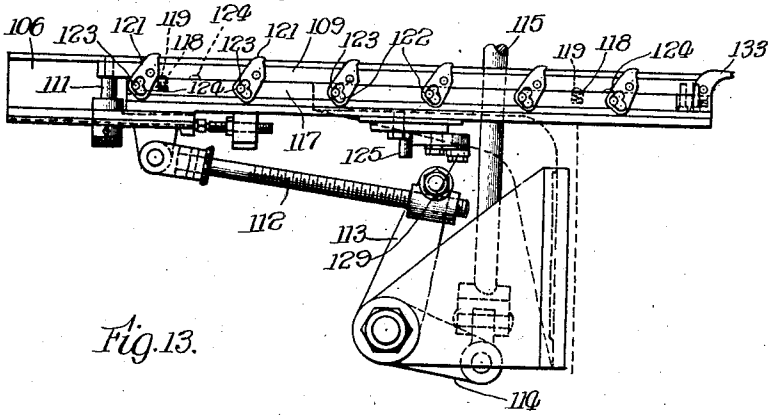
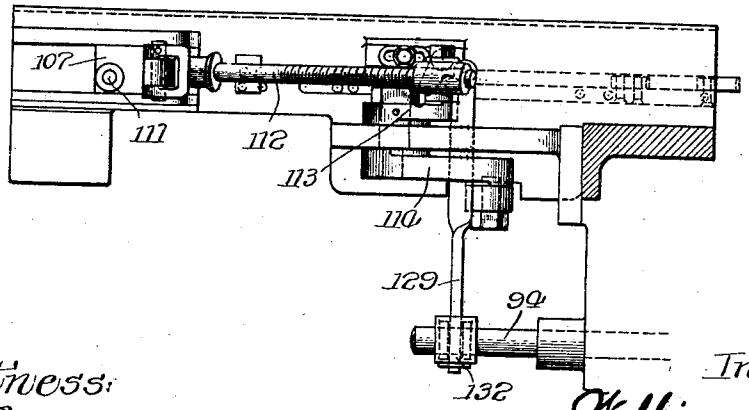


Fig. 13.



Witness:
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Patented Dec. 11, 1923. 1,477,240

UNITED STATES PATENT OFFICE.

WILLIAM CAMERON, OF CHICAGO, ILLINOIS, ASSIGNOR TO CAMERON CAN MACHINERY CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AUTOMATIC DIE PRESS.

Application filed October 13, 1919. Serial No. 330,284.

To all whom it may concern:

Be it known that I, WILLIAM CAMERON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Die Presses, of which the following is a specification.

This invention relates in general to metal working machines and has more particular reference to die presses for stamping out various articles such, for instance, as the tops and bottoms of tin can bodies, a press of this general character being disclosed in my prior patent, #1,277,342, granted August 27, 1918, over which machine the present invention constitutes an improvement.

Machines of this character are ordinarily equipped with a pneumatic feed for lifting the metal blanks from a magazine whereupon the blanks are transferred from the pneumatic lifting devices to a channel along which they are fed in a step by step movement by suitable feed mechanism. The pneumatic apparatus by which the blanks are lifted in succession from the magazine consists of a plurality of suction cups to which vacuum is applied. Should a sheet or blank be warped or bent or should one or more of the cups for any reason not become firmly attached to the sheet being lifted, the sheet will be released, or partially released, before it is fully engaged by the transferring mechanism, with the result that it will not properly enter the feed channel and a jam will result. Another object of my present invention is to provide means in conjunction with the suction cups for accurately positioning and holding the lifted blanks in the path of the transferring mechanism so that they will be transferred into the feed channel with accuracy and precision.

One of the objects of this invention is to break the suction between the suction cups and the lifted blanks just prior to engagement of the blank by the transferring mechanism so that it is unnecessary for the transferring mechanism to overcome the adherence of the sheet to the suction cups, thereby reducing the power required and also reducing the wear on the cups. Heretofore, it has been the custom to apply suction continuously to the suction cups, but during the interval between the removal of a lifted blank from the cups and the engagement of the cups with the next blank in the magazine, the cups are open to the atmosphere so that the vacuum is very low at the time the cups are brought into engagement with the blank in the magazine. My present invention contemplates the production of a maximum vacuum at the instant of the contact of the cups with the blank in the magazine so that a firm adherence of the blank to the cups is secured, which insures the positive lifting of a blank at each actuation of the cups. This desideratum is attained in my present invention by shutting off the suction line between the suction pump and the cups during the inoperative portion of the cycle of movement of the cups, thereby allowing a vacuum to build up in the vacuum reservoir and when the cups are lowered into engagement with a blank in the magazine, communication between this stored up vacuum and the cups is re-established, with the result that a high vacuum is produced at the cups, insuring their firm attachment to the blank.

The modern tendency toward high speed which is required of machines of this character, has resulted in difficulty in handling the stamped out blanks, and particularly, the can tops which are of substantial depth because of the peripheral flange formed around the circumference for the purpose of double seaming the top onto the can body. Upon upward movement of the die, these tops are ejected from the die but since the interval between successive stamping operations is very short, a slight clinging of the stamped out blank to the die will preclude it from dropping by gravity from between the dies before they are brought together again, with the result that the stamped top or other blank is jammed between the dies, thus spoiling two blanks and not infrequently injuring the dies. My present invention, therefore, is designed to facilitate the movement of the stamped blanks from between the dies so that they will be entirely out of the path of travel of the dies before the dies are brought together to effect the next stamping operation.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following description, when considered in connection with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a front elevation of a die press embodying my invention;

Fig. 2 is an end elevation thereof with the fly-wheel removed;

Fig. 3 is a sectional view showing the clutch and automatic brake;

Fig. 4 is a view taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary view of the machine frame, showing the pneumatic pump and connections;

Fig. 6 is an end view of the magazine and feed channel showing the end of the feed bar;

Fig. 7 is a detail view of one of the suction cups and its related mechanism;

Fig. 8 is a similar view looking at the front of the cup shown in Fig. 7;

Fig. 9 is a bottom view of the cup;

Fig. 10 is an enlarged longitudinal sectional view of the cup;

Fig. 11 is a bottom view of the feed bar and press stopping mechanism;

Fig. 12 is an elevation of the feeding mechanism; and

Fig. 13 is a view similar to Fig. 11, but showing the feed bar operating mechanism.

By reference to the drawings, it will be observed that the machine comprises generally a frame 15, provided near its top with suitable bearings 16, in which the main power shaft 17 is journaled. The shaft is provided between the bearings with a crank 18, by which the cross-head 19 is reciprocated in guide-ways 21 of the machine frame by means of a pitman 22 in the usual manner. The upper die 23 carried by this cross-head is adapted to co-operate in its reciprocatory movements with the stationary die 24 mounted on the bed of the machine.

The blanks of tin or other material to be operated upon designated by reference character 25 are disposed in a pile in the inclined magazine 26 from which they are lifted in succession by a series of suction cups 27 into alinement with the feed channel 28, whereupon they are moved laterally edgewise into this channel by transferring devices 29 as shown in Fig. 6.

Each suction cup is mounted upon the lower end of a pipe 31 adapted to reciprocate in a guide-way 32 fixed upon the machine frame, reciprocatory movement being imparted to the cups at predetermined intervals from arms 33 mounted on a rock shaft 34 and respectively connected with their suction cups by links 35, which have a yieldable connection with the arms 33 as disclosed in my prior patent above mentioned. The shaft 34 is rocked by means of an arm 36, which is actuated by a link 37 connected at its opposite end with a crank pin 38 mounted on one of the gears of a train driven from the main shaft 17 by a sprocket chain 39. The upper ends of the pipes 31 are connected by common header 41, which is connected by hose 42 and pipe 43 with vacuum producing mechanism which will be later described.

The transferring mechanism for transferring the lifted blanks into the feed channel consists of a plurality of reciprocatory heads 29 reciprocating parallel with the plane of the blanks and actuated by arms 44 connected with a rock shaft 45 which is actuated from a lever (not shown) which, in turn, is operated by a cam on one of the gears of the train previously mentioned. Since the details of the mechanism for reciprocating the suction cups and the transferring devices forms no part of my present invention, these details are not fully illustrated in the accompanying drawings, but reference may be had regarding the details of their structure to my prior patent above mentioned.

Referring now more particularly to Figs. 7 to 10 inclusive, it will be observed that the guides 32 for the suction cups are carried by arms 46, projecting laterally from and adjustably mounted upon a plate 47 of the main frame of the machine. The cup itself consists of the body 27 cupped at its outer face as indicated at 48, in which cup there is disposed a flexible disk 49 of leather, rubber, or other material which will snugly contact with the flat blanks when brought into engagement therewith. A hollow screw 51 passed through central apertures in the disk 49 and the head of the cup and threaded into the lower end of the pipe 31 securely connects the parts together while at the same time, affording provision for detachment of the parts in case of replacement or repairs.

Prior to my invention, it has been customary to lift the blanks from the magazine by suction cups which served to hold the blanks in elevated position in the path of travel of the transferring devices and when these devices engaged the blank, they would slide it edgewise laterally along the face of the cups which were relied upon to hold the blank in alignment with the feed channel. This sliding movement of the blanks along the faces of the cups resulted in rapid wear of the cups and furthermore, if the movement of a blank should break the seal between the blank and a cup, the blank would have the tendency to drop and not properly enter the feed channel. In any event, breakage of the seal resulted in loss of control of the blank and jams occasioned by this premature release of the blank not infrequently occurred. With a view of obviating this difficulty, I have mounted upon the arm 46 adjacent to each cup, a substantial U-shaped member 52, the ends of which are disposed at each side of the cup and pro-

ject slightly below the plane of the cup face when it its uppermost position, as will be evident from Fig. 7. When a blank is elevated by the cups, it will be brought into engagement with the ends of these members 52 just prior to the termination of the upward stroke of the cups and the continued upward movement of the cups after the blank has engaged these members will break the seal between the cups and the blank and leave the blank free from the cups so that upon edgewise movement of the blank by the transferring devices no wear upon the cup results. These members 52, therefore, serve as stops which release the blanks from the cups and they also serve to hold the blanks in accurate alinement with the feed channel. To effect this result the members 52 are magnetized so that when a blank is brought in contact with these members and is released from the cups, it is held in proper position by magnetic attraction. This manner of holding the blanks insures that they will be under control at all times and since this magnetic attraction offers but very slight resistance to edgewise movements of the blanks in comparison with the pneumatic suction of the suction cups, the power required to transfer the blanks into the feed channel is materially reduced, and furthermore, as previously stated, the wear on the cups resulting from continued sliding of the blanks across the face of the cups is entirely eliminated.

In order to ensure a vacuum at the suction cups of sufficient strength to firmly attach the blanks to the cups each time the cups are lowered into engagement with the stack of blanks in the magazine, I have made provision for building up or storing a vacuum which is applied to the cups approximately simultaneously with their engagement with a blank by mechanism which will now be described.

At one side of the machine I have mounted a reciprocatory air pump comprising a stationary cylinder 53 and a reciprocatory piston 54 actuated by a connecting rod 55 from an eccentric 56 mounted upon the main shaft 17. The intake or suction side of the pump is connected with the line 43 running to the suction cups, but instead of being directly connected into the cylinder, I utilize in conjunction therewith, a vaccuum storage chamber or tank, best illustrated in Figs. 2 and 5.

By reference to these figures, it will be observed that a pipe 57 is connected at one end with the cylinder and at its other end with a tank or chamber 58, located between the spaced uprights of the machine frame. This tank is supported at one end by the pipe 57 passing thru the frame and at its other end by a pipe 59 passing thru the other side of the frame and connected with a vacuum gauge 61, from which the amount of vacuum in the chamber may be observed. A check valve 62 interposed in the pipe 57 ensures the maintenance of the vacuum created in the pipe 57. Pipe 43 is connected with the pipe 57 between the pump and the chamber 58 and a poppet valve 63 is interposed in the vertical leg 64 of the line. This valve is normally open so that vacuum is induced in the line 43 and consequently in the suction cups both from the pump and from the storage chamber 58. A spring however, in the valve, tends to close the valve, thus shutting off the vacuum in this line. The valve is opened at predetermined intervals and maintained in an open position for a predetermined period by means of a lever 64 fulcrumed at 65 on a bracket 66 depending from the valve casing. This lever is actuated at predetermined intervals through a link 67 from a cam 68 mounted upon a continuously rotating shaft 69, a tractile spring 71 being employed to normally hold the parts so that the valve 63 is open. In the operation of the machine, the valve 63 is closed just after the seal between the suction cups and the lifted blank has been broken as the cups approach the upper limit of their stroke. Since the suction pump operates continuously, it will build up a vacuum in the tank 58 while the cups are traveling downwardly and when they have been moved into engagement with the uppermost blank in the magazine the valve 63 will be suddenly opened, thereby applying the full force of the stored up vacuum to the suction line 43 and consequently to the cups, with the result that the high vacuum suddenly created at the cups will draw the blank snugly against the faces of the cups and firmly and securely hold it during its raising movement. It will thus be manifest that by this apparatus, I am able to multiply the vacuum normally produced by the pump and thereby ensure the accurate lifting of a blank from the magazine.

In the embodiment of my invention shown on the drawings for purposes of illustration, the suction pump also performs another function, namely, that of an air compressor, and the air compressed by this pump is utilized to discharge the stamped out objects from between the dies. Referring to Figs. 1, 2 and 5, it will be observed that adjacent to tank 58, I have mounted another tank 72, which is connected with the exhaust port of the pump by pipe 73 equipped with a check valve 70, a branch pipe 74 connected with the opposite end of the tank extends upwardly to the top of the press where it is equipped with a shut-off valve 75. This valve is similar in structure to the valve 63 and is normally closed by a spring. A lever 76 pivoted upon a

bracket 77 is adapted to be actuated at each revolution of the press by a cam 78 mounted upon the crank arm 79. From the valve 75 the pipe 73 is extended along the side of the press to the front thereof, where it terminates adjacent to the dies 23 and 24 in a nozzle 81, which is so positioned that when the valve 75 is open, a blast of air will be projected transversely between the dies to discharge the blank, which has just been formed in a rearward direction from between the dies so that it will not be caught between them upon the next stroke of the movable die. This mechanism, therefore, serves to ensure the discharge of the formed can top or bottom and precludes the accidental smashing of this blank between the dies upon the next succeeding stroke.

While I have shown in the present instance a system in which the pressure is derived from the pump which produced the vacuum for the vacuum system, it will be obvious that the air pressure for the nozzle 81 may be derived from any convenient source such as a compressed air line, if preferred, with which many factories are equipped.

It is essential in machines of this character that when they are stopped for any reason, the upper die should be in its uppermost position, thus permitting access to the dies and to the work between them. The driving mechanism for the press consists of a belt pulley 82, rotatably mounted upon the shaft 17 and adapted to be connected with the shaft by a clutch. The shaft is equipped adjacent to the hub of the wheel with a collar 83 in which there is slidably disposed, a clutch pin 84 normally urged outwardly into engagement in a socket 80 formed in the inner face of the hub 85 of the wheel, by means of an expansion spring 86. A clutch shoe 87 pivoted to the machine frame at 88 is formed at its upper extremity to provide a cam face 89, which, when disposed in the path of travel of the clutch pin 84, engages in a notch or transverse groove 91, formed in the outer face of the clutch pin 84 and withdraws the clutch pin from the socket 80 in the drive wheel hub, thus unclutching the wheel from the shaft. A tractile spring 92 normally urges the clutch shoe 87 into operative position, from which it is withdrawn into the position shown in Fig. 2 by a hand lever 93 pivoted to the machine frame at 94 and connected by means of a yoke 95 and a link 96 with the clutch shoe.

In order to overcome the momentum of the machine and bring the same to rest without injury to the machine upon the release of the clutch, I have provided a stopping mechanism which accomplishes this purpose automatically and entirely eliminates from the press construction the usual band brake which has heretofore been employed to accomplish this purpose.

Referring now more particularly to Figs. 1 to 4 inclusive, it will be observed that I have loosely mounted upon a bolt 97, a stop member 98, having a curved end disposed in close proximity to the clutch collar 83, its upper end being urged outwardly away from the machine frame by a plurality of heavy coil springs 99 disposed in sockets formed in the machine frame. The outward movement of the stop member is adjustably limited by a lag bolt 101 extending through an aperture formed midway in the stop member 98 and threaded into a tapped opening into the machine frame. By threading this bolt inwardly or outwardly, the position of the upper end of the stop member may be regulated as the springs 99 will always force the member outwardly away from the machine frame as far as is permitted by the adjusting bolt 101. The inner end of the clutch pin 84 inwardly of the transverse groove 91 is so proportioned that when the clutch pin is withdrawn by the cam face 89 of the clutch shoe, this portion of the pin will be wedged between the clutch shoe and the stop member 98, thus quickly but yieldingly bringing the shaft 17 to rest. In order to ensure against engagement of the clutch and pin with the upper edge of the stop member, this edge is chamfered off as indicated at 102.

It will be manifest that when the clutch shoe is moved by the hand lever from the inoperative position shown in Fig. 2 to the operative position shown in Fig. 3, wherein it is disposed in the path of travel of the clutch pin, the clutch pin as the shaft revolves will be withdrawn from the socket in the fly wheel by the cam face 89, thus effecting the clutch release and simultaneously, this clutch pin will be wedged between the clutch shoe and the yielding stop member 98 so that movement of the pin and consequently, of the whole press, will be yieldingly resisted by a gradually increasing force until the press is brought positively but gently to rest.

The blanks 25 after having been lifted from the magazine and transferred into the feed channel 28 in the manner previously described, are fed longitudinally forward by a step by step movement between the dies so that an article is stamped out at each reciprocation of the upper die in the usual manner. During its approach to the die, the blank is guided and held by a guiding device 103 fully described in my prior patent before mentioned, and after the blank has been completely used up, the scrap is thrown out by a throw-out lever 104 equipped with a finger 105, said lever being actuated from an arm 106, all in the usual manner.

The mechanism for feeding the blanks along the feed channel to the dies consists primarily of a reciprocatory feed bar equipped with a plurality of feed dogs which advance the blanks by a step by step movement.

Referring to Figs. 1, 6 and 11 to 13 inclusive, reference character 106 indicates the channel or groove in which the feed bar reciprocates. A cross head 107 adapted to reciprocate in suitable guide-ways 108 beneath the feed bar channel is connected to the upper member 109 of the feed bar by means of a pin 111 which when removed to disengage the feed bar from the cross head enables the feed bar to be withdrawn bodily from its guide channel. The cross head is reciprocated by means of a link 112 connected to an arm 113 of a bell crank lever, the other arm 114 of which is connected by a link 115 with the crank pin 116 carried by the main shaft 17 so that upon each revolution of this shaft, a complete reciprocatory stroke of the feed bar will be performed.

Instead of employing a solid feed bar as has heretofore been customary, I have devised a feed bar consisting of two members, namely, an upper member 109 and a lower member 117. These members are yieldingly locked together in the position shown in Fig. 12 by a plurality of spring pressed latch members 118 carried by the lower member and adapted to seat in correspondingly shaped depressions 119 formed in the opposed face of the member 109. Upon one side of the member 109, I have pivoted a plurality of feed dogs 121, which project above the feed bar in position to engage the rear edge of a blank in the feed channel so that upon each reciprocation of the feed bar, the blank will be fed forward the distance between two adjacent dogs. Each dog is provided beneath the member 109 with a somewhat arcuately shaped opening 122, in which is disposed a pin 123 fixed to and projecting laterally from the feed bar member 117. So long as no abnormal resistance is offered to the step by step feeding movements of the blanks toward the dies, the feed bar will operate with its parts relatively disposed as shown in Fig. 12. Should an abnormal resistance to the feeding movement of the blank be encountered, however, the strain or backward pressure exerted upon the particular dog which is performing the feeding operation, will cause this dog to swing in a counter clockwise direction upon its pivot, thus causing a relative longitudinal movement between the feed bar members 109 and 117 sufficient to cause the latch members 118 to be disengaged from their depressions 119 and engaged in depressions 124. This relative movement between the members 109 and 117 of the feed bar is utilized to bring the machine to a stop, by means of mechanism which will now be described.

Projecting downwardly from the member 117 is a pin 125 and in the path of this pin, mounted upon an adjustable bracket 126 attached to the machine frame, is a bell crank lever 127, pivoted to the bracket 126 at 128. The short arm of this bell crank lever is connected with a link 129. This link carries at its lower end a pin 131 which upward movement of the link, is adapted to swing upwardly an arm 132 fixed upon the rock shaft 94 upon the other end of which is mounted the hand lever 93. It will be obvious that upon rocking movement of the rock shaft 94 in a counter clockwise direction, the clutch shoe will be moved upwardly in to the path of the clutch pin, thereby stopping the press.

When the feed bar is operating normally, the pin 125 upon the feeding stroke of the feed bar does not travel far enough to contact with the bell crank lever 127 but when the member 117 carrying the pin 125 is slid forwardly relatively to the member 109 as the result of excessive resistance offered to the movement of one of the feed dogs as previously explained, the pin 125 engages the bell crank lever as the feed bar moves forwardly and rocks this lever, thereby rocking the shaft 94 and stopping the press in the manner explained. Upon return movement of the feed bar, the parts 109 and 117 will be restored to normal position.

The last feed dog 133 on the feed bar is longer than the others as will be apparent from Fig. 12 and its purpose is to move the blank farther on its last feeding stroke so that it will be out of the way of the next blank inserted into the feed channel by the transferring devices. The bottom wall 134 is vertically adjustable by means of screw bolts 135 (Fig. 6) to accommodate the machine to blanks of various widths.

It is believed that my invention, its mode of operation and many of its inherent advantages will be readily understood and appreciated from the foregoing without further description and while I have shown and described a preferred embodiment of the invention, it should be manifest that various changes in the size, shape, proportion and arrangement of the parts disclosed may be resorted to without departing from the essence of the invention as set forth in the appended claims.

I claim:

1. In a machine of the class described, the combination of a plurality of suction cups adapted to engage a sheet of material, means for reciprocating said cups, means for applying suction to the cups, means for shutting off the suction to the cups during

their downstroke, means for stripping a sheet from the cups as they approach the upper limit of their movement and for holding said sheet in position, and means for transferring said sheet edgewise from said holding means.

2. In a machine of the character described, the combination of a magazine for supporting a stack of blanks, a plurality of reciprocatory suction cups, a vacuum line including a stationary pipe and a flexible hose connected with all of said cups, means for simultaneously reciprocating said cups toward and from said magazine, vacuum controlling means interposed in said pipe, movable mechanism for operating said vacuum controlling means in timed relation to the movement of the cups to thereby cause vacuum to be admitted to all of said cups simultaneously at the lower limit of their travel and to be relieved simultaneously on all of said cups at the upper limit of their travel, transferring devices reciprocable transversely to the path of travel of said cups, and means for reciprocating said devices in predetermined timed relation with respect to the movements of the cups whereby a blank lifted from the magazine is transferred laterally from the path of movement of said cups.

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