Feb. 6, 1940. A. M. CAMERON 2,188,939

VACUUM CAN CLOSING MACHINE

Filed April 19, 1937 3 Sheets-Sheet 1

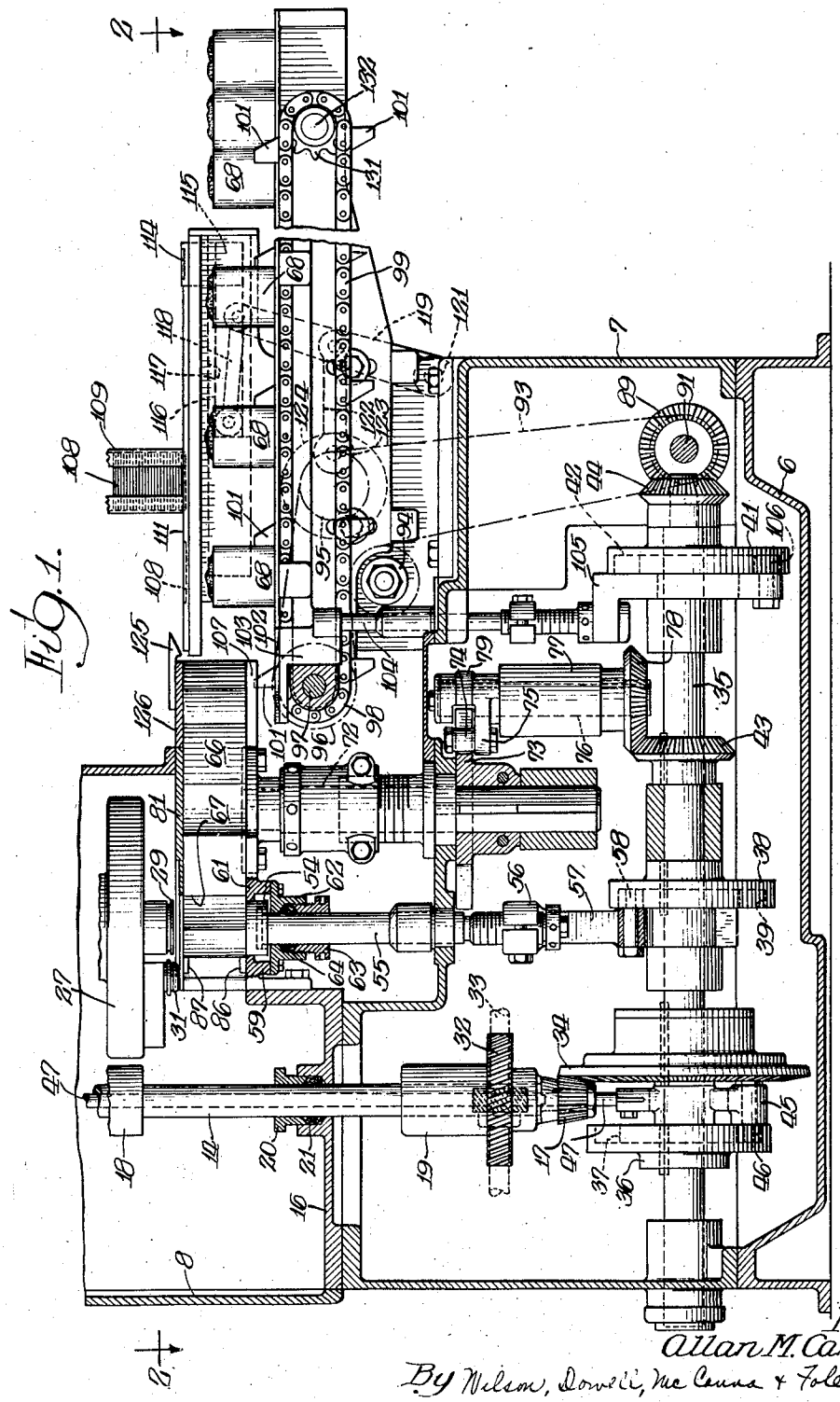


Fig. 1.

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Fig. 3.

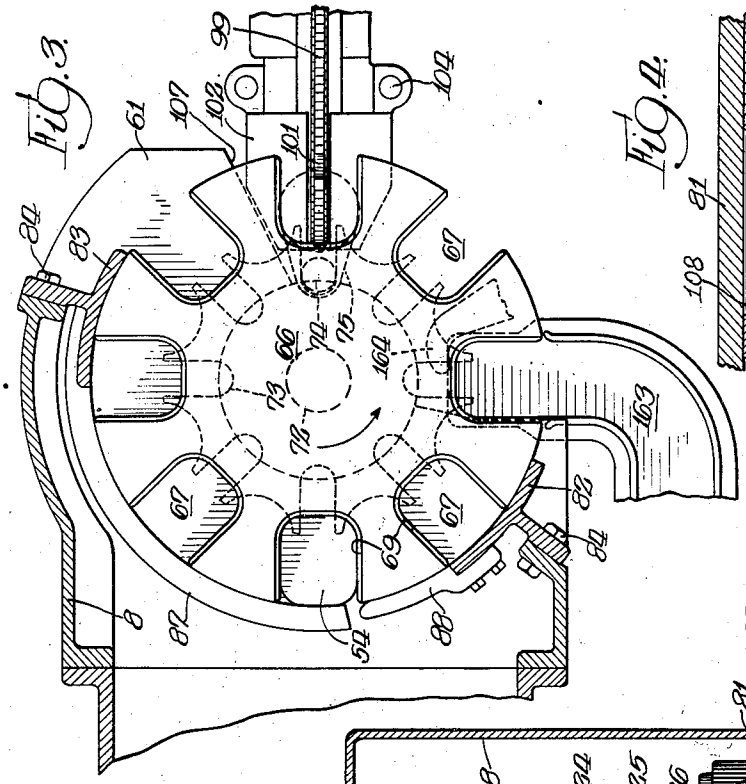


Fig. 4.

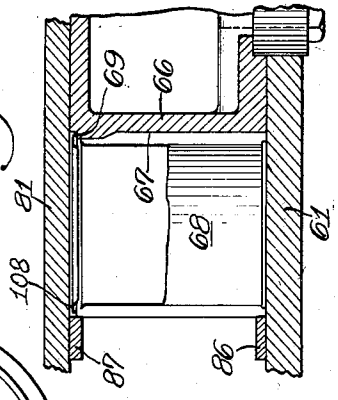
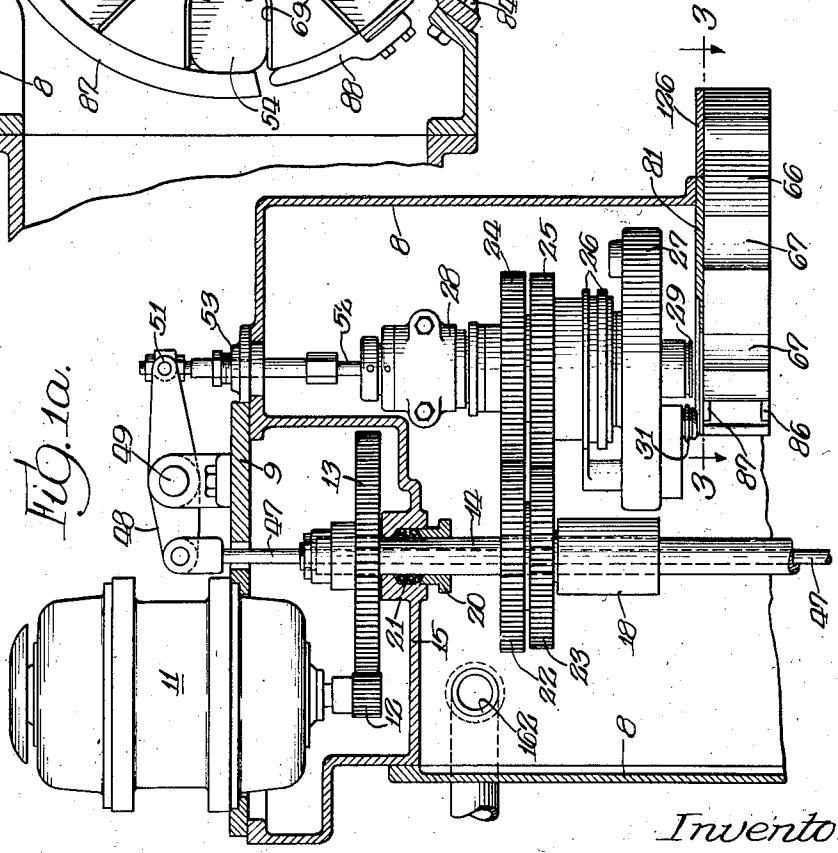


Fig. 1a.



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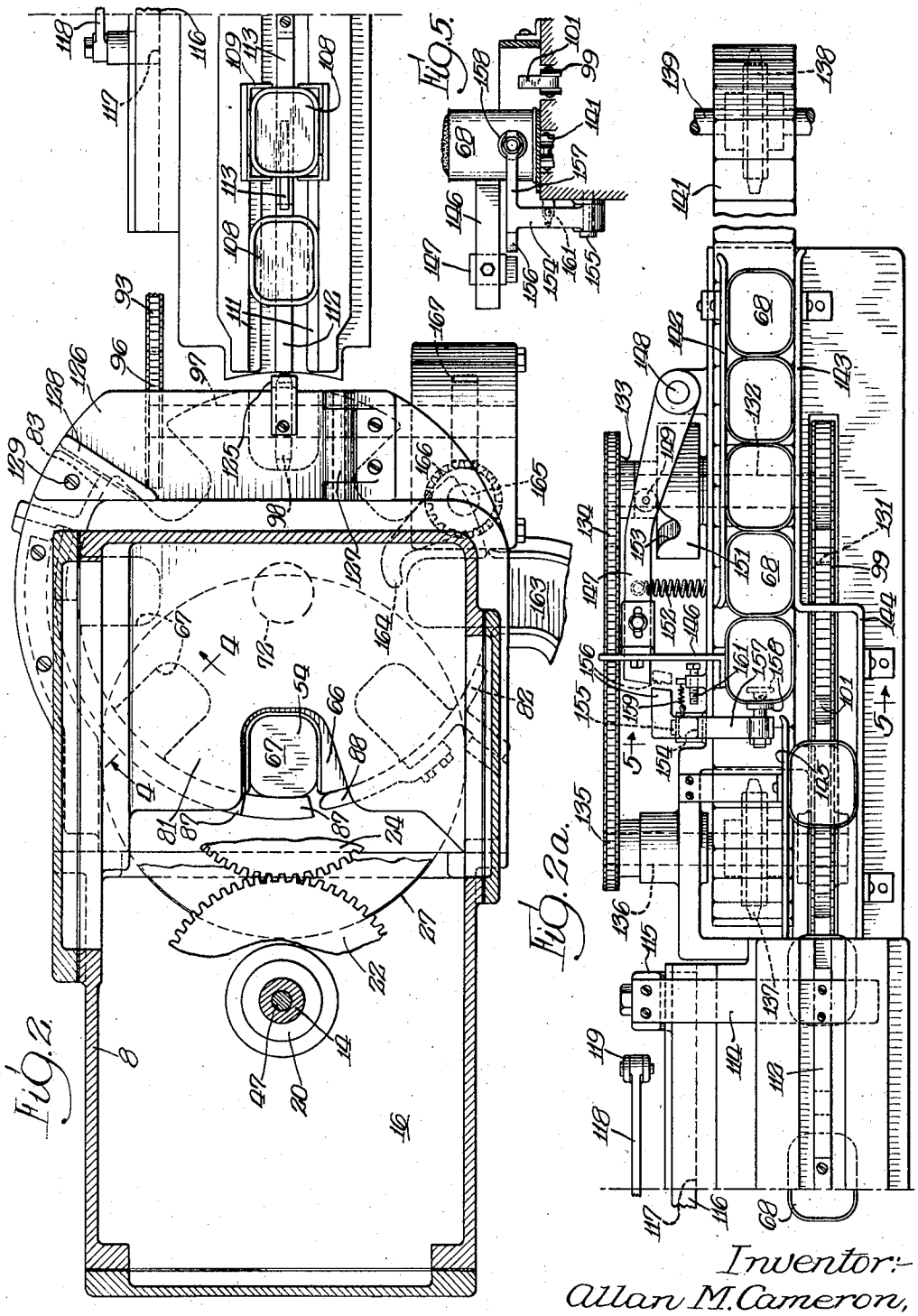


Fig. 2.

Fig. 5.

Fig. 2a.

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Patented Feb. 6, 1940 2,188,939

UNITED STATES PATENT OFFICE

2,188,939

VACUUM CAN CLOSING MACHINE

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Application April 19, 1937, Serial No. 137,674

7 Claims. (Cl. 113—82)

This invention pertains in general to closing machines adapted to double seam the ends or caps onto previously formed and filled tin can bodies. While many of the principles of the invention are capable of embodiment in closing machines generally of this type, some of the important features with which this invention is concerned have reference more particularly to closing machines of the vacuum pack type, that is, machines adapted to close and seal the can bodies in vacuo so that the contents of the cans are retained and preserved in a vacuum or partial vacuum.

In closing machines of the vacuum type, considerable difficulty has heretofore been experienced in maintaining a sufficiently high vacuum in the chamber in which the double seaming operation is performed by reason of the fact that the chamber walls were necessarily penetrated by several rapidly operating machine parts involved in the operation of the double seaming mechanism located in the chamber. The maintenance of a hermetic seal between these rapidly operating parts and the chamber walls through which they extended presented a continuous problem because the packing and seals of various types soon became worn as the result of the rapid operations with resultant leaks and loss of vacuum in the chamber.

My present invention is designed to overcome the sealing difficulties to which reference has been made by positioning all of the rapidly operating parts of the seaming mechanism entirely within the chamber so that the chamber walls will be penetrated only by slow moving parts which can be effectually sealed and the seals for which, because of the slow operation, can be maintained for long periods without undue wear or necessity for renewal.

Heretofore also considerable difficulty has been experienced in maintaining a hermetic seal between the turret by which the can bodies are introduced into and removed from the vacuum chamber and the vacuum chamber walls contiguous to the turret. One of the purposes of my present invention is to maintain an effective seal between the turret and the surrounding chamber and without the employment of resilient packings or other elements which are subject to wear and deterioration with resultant leakage.

Another feature of my invention resides in the provision of a rigid top plate above the turret at a point where the filled can bodies are fed to the turret which will oppose the upward thrust of the filled bodies if the contents project above the tops of the bodies, thereby serving to press the contents down into the bodies to enable the caps to be readily applied. Furthermore, this plate is mounted so as to be readily removable so as to permit access to the body and cap beneath in the event of an accidental jam or other defect in operation. The removal of the plate enables the operator of the machine to relieve the jam or remedy the defect, whatever it may be.

Another feature of this invention resides in the mechanism by which the filled can bodies are delivered to the turret, the delivery being such that the movement of the filled bodies is continuous from the conveyor into the turret without abrupt change either in direction or speed so that the contents of the bodies, and particularly if they be liquid, are not disturbed or caused to slop over.

The mechanism by which the can bodies are separated one from another and fed to the turret in predetermined timed relation and by which jamming or injury to the bodies by reason of improper spacing is obviated constitutes also one of the novel and advantageous features of this invention.

For the purpose of exemplification, I have illustrated on the accompanying drawings a preferred embodiment of my invention, from an inspection of which, when considered in connection with the following specification, the construction, operation and practical advantages of my invention should be readily appreciated.

Referring to the drawings:

Fig. 1 is a fragmentary vertical sectional view through a closing machine constructed in accordance with my invention;

Fig. 1ª is a similar view constituting an upward continuation of Fig. 1;

Figs. 2 and 2ª constitute together a transverse sectional view of the machine taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view on the line 3—3 of Fig. 1ª;

Fig. 4 is a fragmentary sectional view on the line 4—4 of Fig. 2; and

Fig. 5 is an elevation of one of the machine details taken substantially on the line 5—5 of Fig. 2ª.

Referring to the drawings more in detail, reference character 6 indicates the base of the machine which, together with the closed frame 7 carried by the base, forms a closed housing for many of the operating parts of the machine. Upon the housing 7 is mounted the vacuum chamber 8 in which the double seaming mecha-

nism, to be later described, is contained; and above this chamber on a plate-like support 9 constituting a portion of the top of the machine is mounted the electrically operated driving motor 11 by which the entire machine is driven.

The lower end of the motor shaft is equipped with a pinion 12 which meshes with and drives a gear wheel 13 fixed upon the upper end of the hollow shaft 14 which extends vertically through the upper wall 15 and lower wall 16 of the vacuum chamber and is provided at its lower end with a bevel driving pinion 17. This shaft is journalled in an upper bearing 18 and a lower bearing 19 and is hermetically sealed against leakage into the vacuum chamber by suitable packing glands, each comprising a packing nut 20 acting to compress packing material 21 into sealing relation with the perimeter of the shaft. Within the vacuum chamber there is fixedly mounted upon the shaft 14 a pair of gears 22 and 23 of different diameters meshing respectively with the seaming head driving gear 24 and a cam actuating gear 25 by which the control cams 26 and the seaming head indicated generally by 27 are respectively rotated at different speeds. The shaft carrying the head, the cams and the last-mentioned gears is journalled at its upper end in a bearing 28 supported from the walls of the vacuum chamber. The seaming chuck 29 projects beneath the head in the usual manner and one of the seaming rolls adapted to cooperate therewith is indicated by reference character 31.

The details of the construction of the seaming mechanism are not herein illustrated as no novelty for their construction is here alleged. The structural details of these parts are fully disclosed in Cameron Patent No. 1,752,328, issued April 1, 1930. It should be understood, furthermore, that the seaming mechanism disclosed in that patent and here conventionally shown is illustrated merely since my present invention is not confined to employment with any specific design of seaming mechanism.

Near its lower end the shaft 14 is provided with a worm wheel 32 operable through a worm gear from a shaft 33 provided with a handwheel (not shown) by which the machine may be manually turned over when necessary. The bevel pinion 17 previously mentioned meshes with and drives a bevel gear 34 fixed upon a horizontal countershaft 35 extending longitudinally of the machine near the bottom of the housing which shaft carries also a cam member 36 provided with a cam groove 37, a cam member 38 provided with a cam groove 39, a cam member 41 provided with a cam groove 42, a bevel gear 43, and a bevel gear 44, all designed to operate various parts of the machine in timed relation as will be later explained.

A yoke 45 straddling the shaft 35 is vertically reciprocated by the cam member 36 through a roller cam follower 46 located in the cam groove 37, the reciprocation of this yoke being imparted to a rod 47 attached at its lower end to the yoke and extending upwardly through the hollow shaft 14 to the top of the machine where it is connected with a lever or rocker arm 48 fulcrumed at 49 and connected at 51 to the upper end of a knock-out rod 52 extending through the seaming mechanism shaft to the seaming chuck 29 and by which the closed cans are positively freed from the seaming chuck in a well-known manner such as described in previously mentioned Patent No. 1,752,328. The knock-out rod extends through a conventional packing gland 53 which provides a hermetic seal to prevent leakage into the vacuum chamber along the rod.

The can bodies with their superposed caps are brought in succession by the intermittently operable turret, to be later described, beneath and in vertical alignment with the seaming chuck 29 against which they are then lifted by an elevating chuck 54 carried upon a rod 55 which is adjustably connected through a screw and lock connection 56 with a yoke 57 straddling the shaft 35 and adapted to be reciprocated by a follower 58 travelling in the cam groove 39. This lifting chuck when in depressed position, as shown in Fig. 1, is disposed in a housing formed by an annular flange or rib 59 depending from the bottom plate 61 of the vacuum chamber and a packing gland member 62 secured to the flange and equipped with a packing nut 63 and suitable compressible packing 64 by which the vacuum chamber is sealed at this point against leakage along the reciprocating rod 55.

The turret designated generally by reference character 66 is provided with a series of radially opening pockets 67, each shaped and proportioned to receive a can body such as designated by reference character 68. The upper end of each pocket being cut back to provide a supporting shoulder 69 adapted to receive and support a can cap or end 71 in vertical aligned relation with its respective can body disposed in the pocket.

This turret is carried upon a shaft 72 which within the housing of the machine is provided with a star wheel 73 forming one member of the Geneva stop motion, the other member of which consists of an actuating roller 74 (Fig. 1) carried by an arm 75 which is fixed upon a continuously rotating shaft 76 mounted in a suitable bearing 77 and provided at its lower end with a bevel gear 78 meshing with and driven by the bevel gear 43. The segmental arcuate shoulder 79 carried by shaft 76 immediately above the arm 75 cooperates with the concave portions of the star wheel 73 to retain the turret against accidental movement between intermittent actuations of the turret by the arm 75.

The lower face of the turret is machined to fit snugly against the lower plate 61 of the vacuum chamber, and the upper face of the turret is similarly machined for a close fit with a top plate 81 arranged parallel with the plate 61. By an accurate machining of the surfaces of these plates and of the upper and lower faces of the turret, I am enabled to produce a close running fit between the turret and the plates which affords an effective hermetic seal which prevents vacuum leakage from the vacuum chamber between the turret and its cooperative top and bottom plates. The periphery of the turret is sealed against leakage from the chamber by sealing plates 82 and 83 arcuately shaped to conform to the curvature of the turret and adjustably mounted by slot and bolt connections 84 so that when properly adjusted a metal to metal sliding fit is afforded which effectually prevents vacuum leakage from the vacuum chamber along the vertical faces of the turret. In this manner I have provided an efficient seal between the turret and the vacuum chamber without the employment of springs or compressible packings of any nature which would be subject to wear and deterioration resulting in eventual leakage which has constituted one of the heretofore annoying problems in vacuum pack machines of this character.

In Fig. 4 I have illustrated the position of the

top and bottom plates 81 and 61 with reference to the turret and have also shown the position of the can and a cap in one of the pockets 67. From this figure also in conjunction with Fig. 3 it will be observed that displacement of both the can body and its cap from the pocket is precluded by arcuate metal retaining members 86 and 87 respectively and that beyond the seaming station displacement of a closed can from its pocket is precluded by a short retaining finger 88 carried by the sealing plate 82. It should be understood that the retaining members 86 and 87 are likewise attached to the sealing plate 83.

The feeding of the filled can bodies and their ends in timed relation into the turret pockets is accomplished by mechanism which will now be described. The bevel gear 44 through a companion gear 89 drives a transverse shaft 91 carrying a sprocket wheel over which is trained a drive chain 93 passing over idlers 94 and 95 (Fig. 1) and encircling a sprocket wheel 96 fixed on a shaft 97 immediately beneath the forward portion of the turret. This shaft carries intermediate its ends a sprocket wheel 98 over which is trained a conveyor chain 99 equipped at spaced intervals with can body feeding dogs 101. By these dogs the filled can bodies 68 are brought in succession in spaced relation into cooperative relation with the successive turret pockets.

It will be observed from Fig. 1 that the can bodies are fed toward the turret by the chain conveyor 99 below the plane of the turret and that the upper ends of the feeding dogs 101 clear the lower face of the turret to obviate any possibility of interference between the dogs and the turret during their respective movements. The filled bodies are, however, during the latter portion of their travel under the influence of the dogs 101 gradually elevated without abrupt change in either direction or speed until the bottoms of the bodies are disposed just above the plane of the upper face of the bottom plate 61 so that upon movement of the turret a body disposed in a turret pocket will move onto such plate to be supported thereon during the remainder of its travel in the pocket. This gradual elevation of each can body from the plane of the conveyor chain 99 into a pocket of the turret is effected by a plate 102 (Figs. 1 and 3) which is slotted to accommodate the conveyor 99 and is carried by a supporting bracket 103 fixed to the upper end of a reciprocatory rod 104 connected to and actuated by a yoke 105 straddling the shaft 35 and provided with a cam follower 106 riding in the cam groove 42 of the cam member 41. As each can body is moved by the conveyor 99 onto this plate 102, the plate is gradually raised thereby, gradually elevating the body as it is moved toward the turret by the conveyor with the result that the body moves in a curved path into the turret pocket and is supported by the plate 102 at a proper level to clear the edge 107 of the plate 61 as the body is moved by the turret onto this plate by an intermittent counterclockwise (viewing Fig. 3) movement of the turret. As soon as the body has been moved onto the plate 61 and is supported thereby, the plate 102 recedes to its lowered position to receive the next can body advanced by the conveyor 99.

Simultaneously with the feeding of a can body into the turret, a cap for such body is fed into position in the turret pocket above the can body by mechanism for which no novelty is herein claimed and which will now be described in a general way. The caps or ends designated 108 are held in superposed relation in a magazine 109 above a guideway 111 disposed in a horizontal plane common with the cap supporting shoulders 69 of the turret. A reciprocatory feed bar 112 equipped with feed dogs 113 is adapted to remove the caps in succession from the bottom of the magazine and advance them into the successive turret pockets. It is reciprocated by a bar or arm 114 connected with the feed bar and carried upon the upper end of an upwardly extending arm 115 which is secured to a slide bar 116 mounted for reciprocatory movements in a guideway 117, this bar being reciprocated by a link 118 connected at its free end with a lever 119 fulcrumed at 121 upon the machine frame and actuated by a connecting rod 122 attached to a crank pin 123 carried by a wheel or disc 124 formed with or driven by the previously mentioned idler 95. At each rotation of the crank pin 123, a complete reciprocation of the feed bar 112 is effected, thereby delivering a cap into position above its respective body in a turret pocket.

To preclude retractive movement with the feed bar of a delivered cap, a spring dog 125 is mounted on the forward top plate 126, this dog being adapted to permit the feeding of a cap beneath it while preventing return movement of the cap out of the pocket.

The plate 126 beneath which the caps are fed forms in effect a continuation of the top plate 81, as will be apparent from Fig. 1; but this plate is hinged at 127 so that it may be swung upwardly to permit access to a body and cap in the forward turret pocket so that should a jam occur at this point through a defective cap or body or for other reasons such defect may be remedied by the operator by simply swinging the plate upwardly from operative position. The plate is normally held in operative position against movement by an overlying holding lug 128 removably secured by a screw 129 or otherwise to the web of the sealing plate 83.

The conveyor 99 driven by the sprocket 125 is trained over a sprocket wheel 131 fixed on a shaft 132 which carries at its opposite end a sprocket wheel 133 (Fig. 2ª) for the purpose of driving a drive chain 134 trained over a sprocket wheel 135 on a shaft 136 which also carries a sprocket wheel 137. A companion sprocket wheel 138 is carried by a shaft 139 at the in-feed end of the machine and a flat link conveyor 141 is trained over the sprocket wheels 137 and 138 and is driven by the sprocket wheel 137.

The can bodies to be operated upon are placed upon the conveyor 141 by hand or automatically and are carried thereby to the left, viewing Fig. 2ª, between spaced guide bars 142 and 143. The bar 143 is laterally offset intermediate its length as indicated at 144 to permit lateral displacement of the can bodies from the conveyor 141 onto the conveyor 99 and after being transferred from one conveyor to the other the bodies are guided in their travel toward the turret between the offset portion 144 and a companion guide bar 145.

The conveyor 141 is a flat conveyor without feed dogs and the can bodies are continuously advanced thereby in whatever relation, either spaced apart or contiguous, they are placed upon the conveyor. To insure their transfer onto the conveyor 99 in proper relation to the feed dogs 101 carried thereby, transfer mechanism comprising a pusher 146 carried by a lever 147 ful-

crumed at 148 is provided. This lever is normally held in the retracted position shown in Fig. 2a by a cam follower 149 depending from the lever which is caused to follow the contour of a cam 151 on the shaft 132 by a tractile spring 152. As the depression 153 in the face of the cam 151 registers at each revolution of the cam with the follower 149, the spring 152 actuates the pusher 146 to transfer a can body aligned therewith from the conveyor 141 on to the conveyor 99. The timing is such that each can body transferred is positioned on conveyor 99 immediately in front of a feed dog 101 by which it is carried to the turret.

To insure against jams or injury to can bodies which might occur if the pusher were actuated when a can body was not properly positioned for transfer, I have provided safety mechanism, illustrated in Figs. 2a and 5. This mechanism comprises a stop or abutment consisting of an upright arm 154 pivoted at 155 to the frame of the machine and having a forwardly extending abutment portion 156 disposed in proximity to the end of the lever 147 and a laterally extending portion 157 provided with an adjustable abutment head 158 disposed in the path of a can body being advanced by the conveyor 141. A tractile spring 159 normally urges the abutment member toward the right into the dotted line position shown in Fig. 2a against an adjustable stop 161. When the pivoted member is held against the stop by the spring 159, the abutment end 156 is disposed in the path of the end of the lever 147 as shown in dotted lines in Fig. 2a, so that operation of this lever under the influence of spring 152 is precluded. This position of the parts is assumed and the operation of the pusher is precluded at all times except when the abutment is moved into inoperative position against the action of spring 159 by an advancing can body in which case such can body is disposed in proper position to be transferred on to the conveyor 99, as illustrated in Fig. 2a. By this mechanism, jams and injury to can bodies which would be occasioned by operation of the pusher when a can body was improperly positioned for transfer are obviated.

From the foregoing it should be apparent that filled can bodies placed on the conveyor 141 are carried by this conveyor into proper position to be transferred to proper position on the chain conveyor 99 by the pusher 146 and that unless so properly positioned the pusher is prevented from operating. By the conveyor 99 the bodies are carried in spaced relation on to the elevating plate or platform 102 by which they are elevated during their final advancing movement into a pocket of the turret. Simultaneously a cap has been fed from the magazine 109 into the pocket above the can body where it is supported upon the shoulders 69. A rotative movement is then imparted to the turret by the star wheel drive to move the body onto the bottom plate 61 by which it is supported during its travel into and from the vacuum chamber. When a body and superpositioned cap reach the seaming station, the cap and body are elevated by the chuck 54 into cooperative relation with the seaming chuck 29 where, by the operation of the seaming rollers 31, the head is double seamed onto the body. While in the chamber the contents of the can body are subjected to the vacuumizing action of the chamber, a partial vacuum being created in the chamber through suction applied thereto through the pipe 162.

Upon completion of the double seaming operation, the closed can is advanced by the turret into alignment with the discharge chute 163 into which it is positively discharged by a rotating arm 164 carried upon a shaft 165 (Fig. 2) which is equipped with a worm gear 166 adapted to be driven by worm 167 mounted on the shaft 97 (all as shown in Fig. 2).

The double seaming operation is performed under a partial vacuum. Leakage from the chamber around the turret is precluded by the accurate fit of the chamber walls with the opposed surfaces of the turret which affords an effective hermetic seal, and leakage from the chamber around the shaft 14, the chuck supporting rod 55 and the knock-out rod 52 is precluded by adequate packing glands which, because all of the parts are of the slow moving type, are not subjected to destructive wear and are, therefore, capable of providing efficient seals during long continued use of the machine.

The details of construction illustrated and described are obviously capable of considerable modification and variation without departing from the essence of the invention as defined in the following claims.

I claim:

1. A vacuum can closing machine comprising a rotatable turret having can body and cap receiving pockets, a vacuum chamber provided with an opening through which a segment of said turret extends into the chamber, said opening having end walls arranged to sealingly engage the periphery of the turret and parallel rigid top and bottom walls machined to sealingly engage the opposed faces of the turret whereby the chamber is sealed, a removable top plate overlying a portion of said turret exteriorly of said vacuum chamber, said plate having means thereon normally permitting feeding of a cap into one of said cap-receiving pockets but preventing movement of said cap out of said pocket, double seaming mechanism mounted in said chamber, and means for delivering can bodies and caps to said turret.

2. A vacuum can closing machine comprising a vacuum chamber, a rotatable turret mounted to extend into said chamber, said turret being provided with can body and cap receiving pockets, rigidly mounted metal plates having machined faces affording a metal to metal contact with said turret to provide a hermetic seal for said chamber around said turret, a hinged top plate overlying a portion of said turret, said plate having means thereon normally permitting feeding of a cap into one of said cap-receiving pockets but preventing movement of said cap out of said pocket, and double seaming mechanism mounted in said chamber.

3. A vacuum can closing machine comprising a vacuum chamber, double seaming mechanism therein, a rotatable turret projecting into said chamber, said turret having a series of can body and cap-receiving pockets formed therein, rigidly mounted metal plates forming portions of the chamber walls engaging the top and bottom of said turret with a machined surface metal to metal contact to provide a hermetic seal for said chamber around said turret, and a displaceable plate disposed to normally overlie at least one of the pockets in said turret, said plate having means thereon normally permitting feeding of a cap into one of said cap-receiving pockets but preventing movement of said cap out of said pocket.

4. In a can closing machine, the combination of a rotatable turret provided with can body receiving pockets, top and bottom plates between

which said turret is adapted to rotate, a removable front top plate overlying the pocket positioned to receive a can body, a conveyor for advancing can bodies toward said turret in proximity to one edge of said bottom plate, and a vertically reciprocable plate disposed directly beneath said removable plate, means for raising said vertically reciprocable plate to elevate a can body from said conveyor into an aligned turret pocket and to support the same in said pocket until rotative movement of said turret carries said body onto said bottom plate.

5. In a can closing machine, the combination of a vacuum chamber including a bottom plate extending outside the confines of the chamber, a turret extending into said chamber and provided with can body receiving pockets, a conveyor having one end disposed beneath said turret, an elevator plate onto which said can bodies are moved by said conveyor, means for raising said plate to elevate a can body into one of said pockets during the advance of said body by the conveyor, and means for imparting a rotary movement to said turret to transfer such can body from the elevator plate onto said bottom plate by which the body is supported during the travel thereof through the vacuum chamber.

6. In a can closing machine, the combination of a rotatable turret provided with can body receiving pockets, a conveyor including a chain having one end disposed beneath said turret, a slotted elevator plate straddling the chain beneath said turret and onto which can bodies are moved by said chain and means for raising said plate during the advance of a body thereon by the conveyor to position the same in an aligned pocket of the turret.

7. In a can closing machine, the combination of a vacuum chamber having an opening defined by rigid metal walls, a rotatable turret positioned in said opening and having a metal to metal hermetically sealing contact with said walls, a conveyor chain extending into proximity to said turret, the lower wall of said chamber extending beneath the turret into proximity to said chain, and the upper wall of the chamber extending outwardly over said chain, an elevating device for elevating a can body from said chain into the turret to position its upper end in contact with said outwardly extending upper wall and its lower end above the plane of said extended lower wall, and means for rotating said turret to move the elevated can body off said elevating device and onto said lower wall.

ALLAN M. CAMERON.