

March 13, 1951

J. C. STRICKLER

2,544,735

MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

Filed May 17, 1945

8 Sheets-Sheet 1

Fig. 1

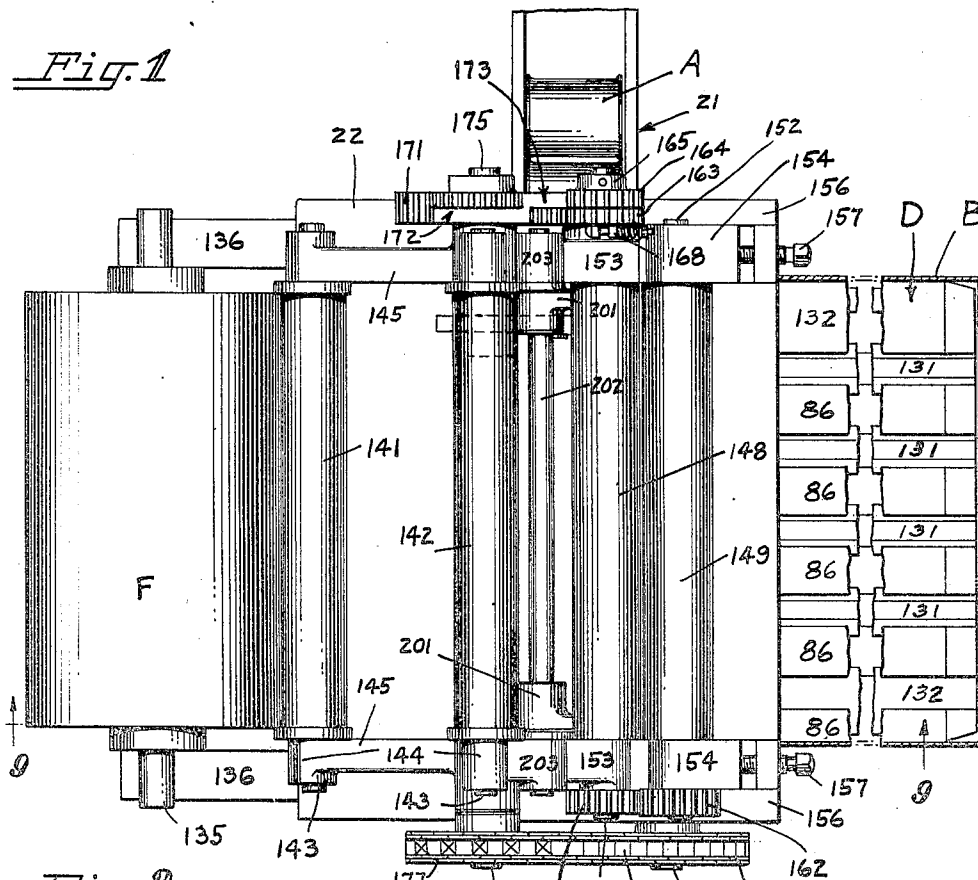


Fig. 2

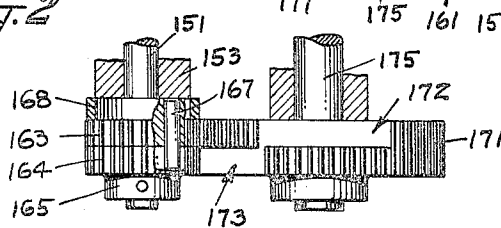


Fig. 4

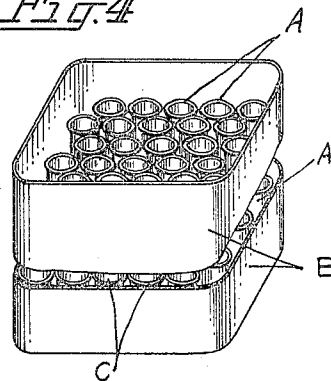
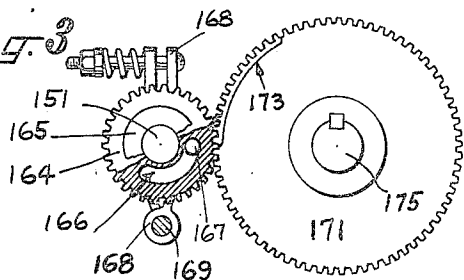


Fig. 3



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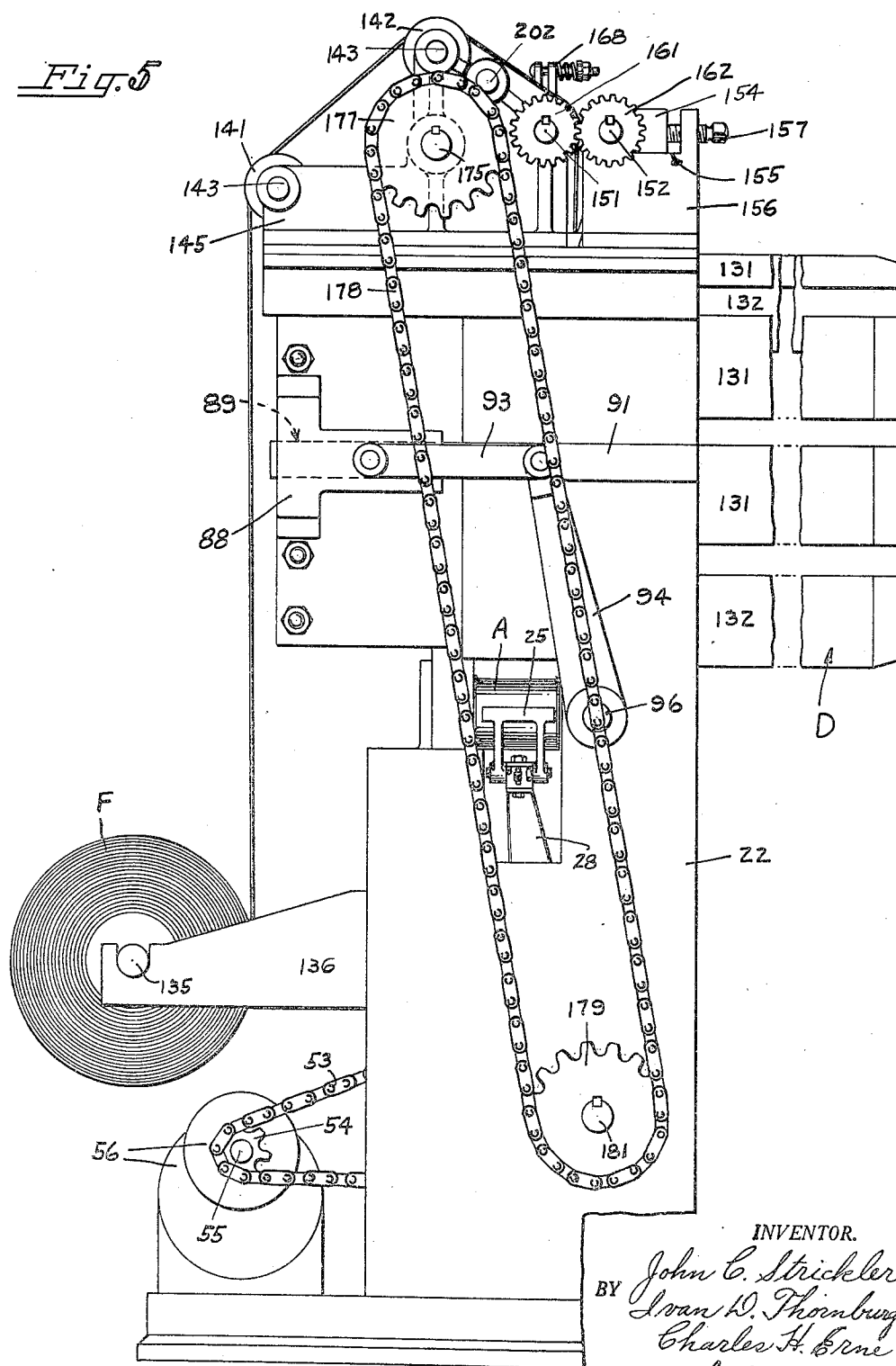
2,544,735

MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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*Fig. 5*



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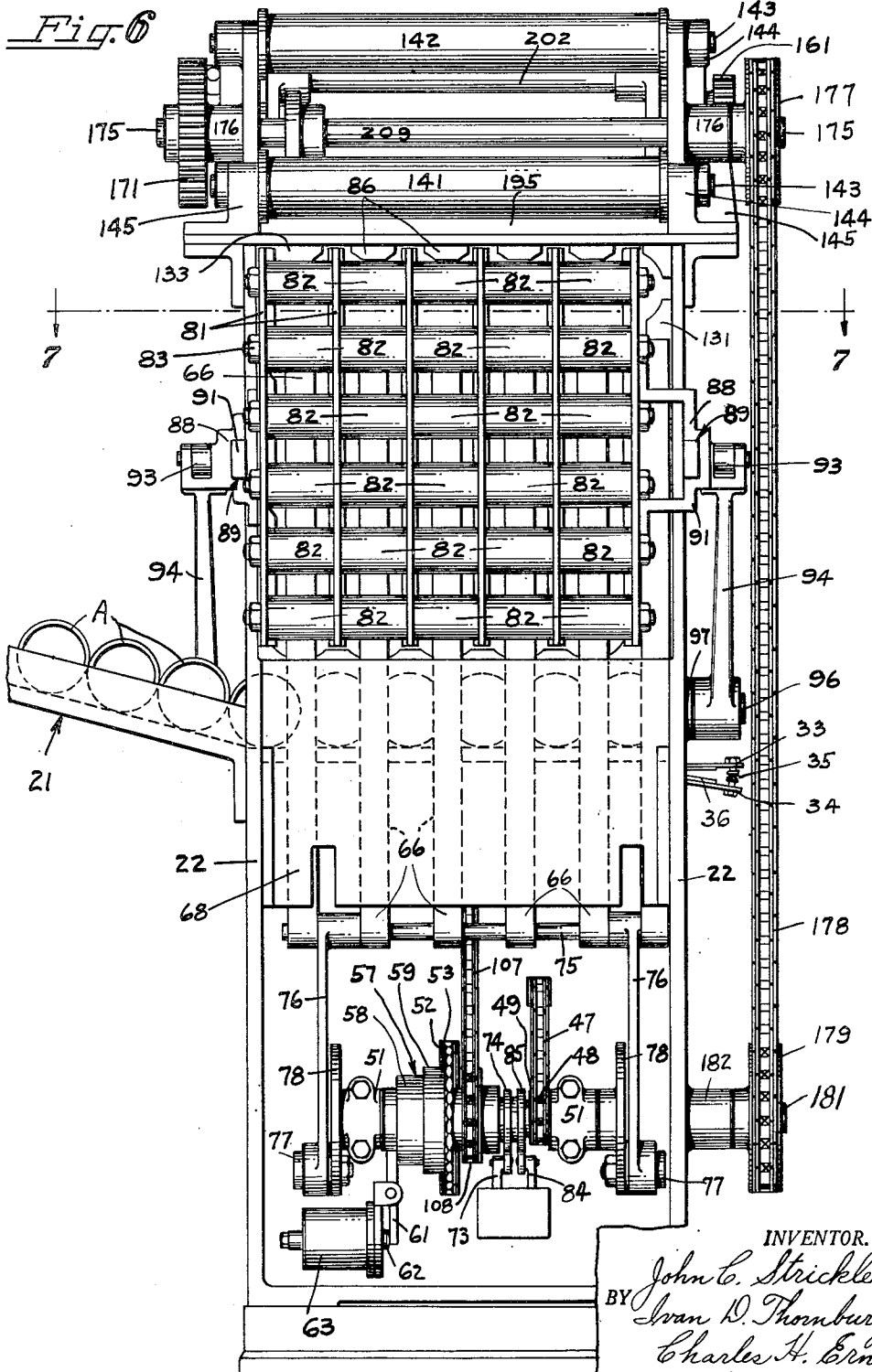
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MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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8 Sheets-Sheet 3



March 13, 1951

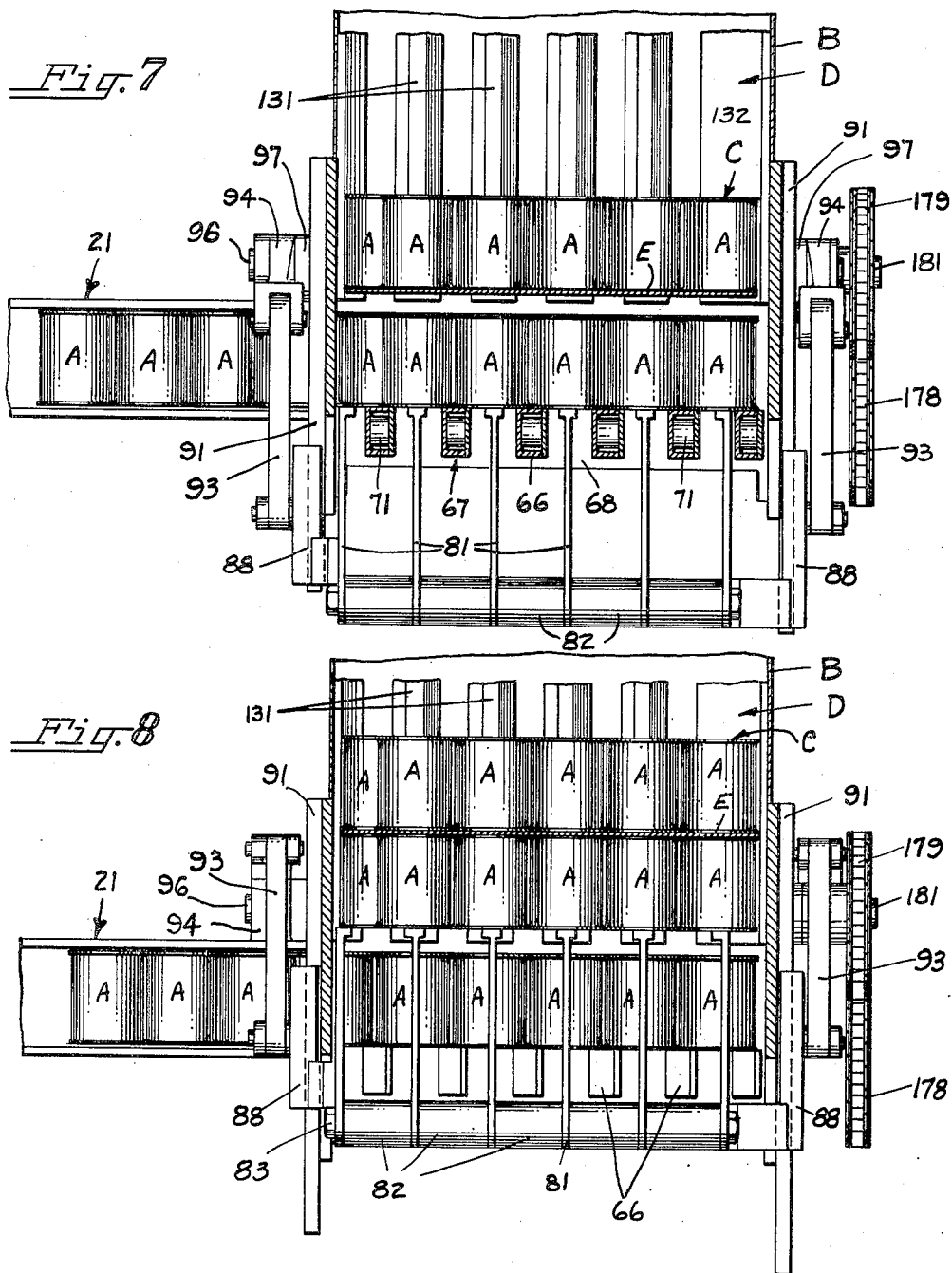
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MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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8 Sheets-Sheet 4



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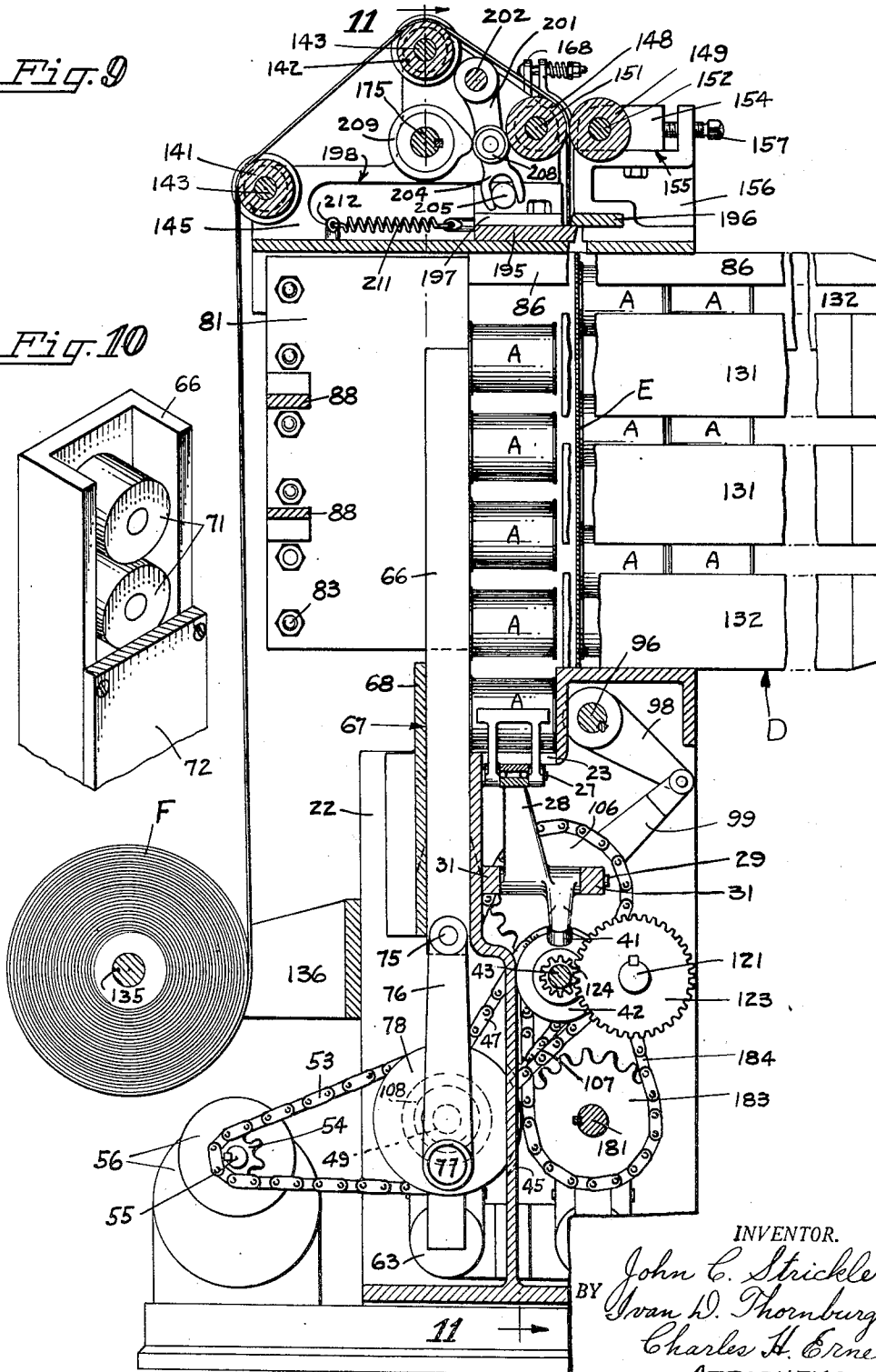
MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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*Fig. 9*

*Fig. 10*





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MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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Fig. 17

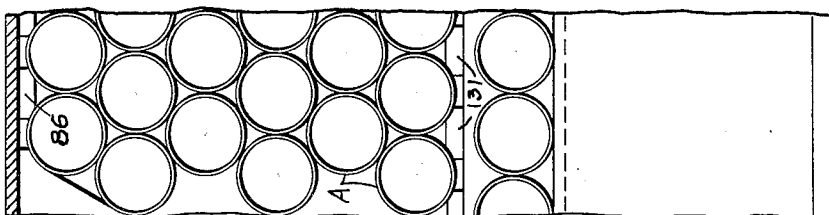


Fig. 16

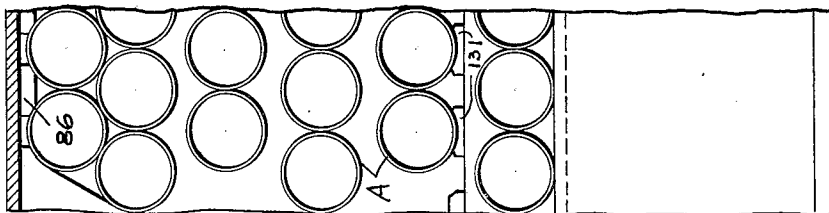


Fig. 15

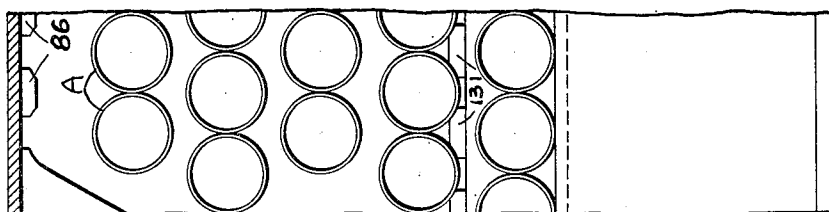


Fig. 14

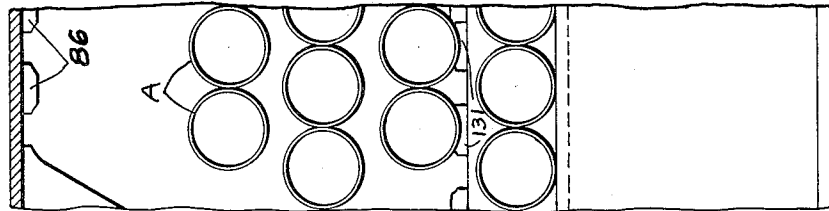


Fig. 13

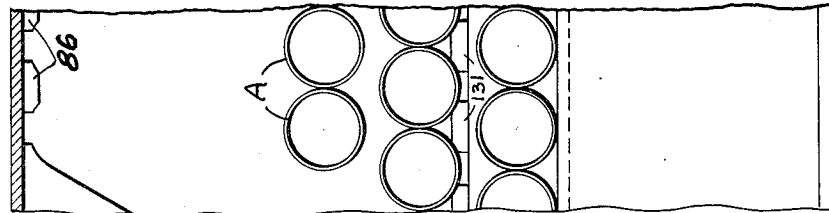
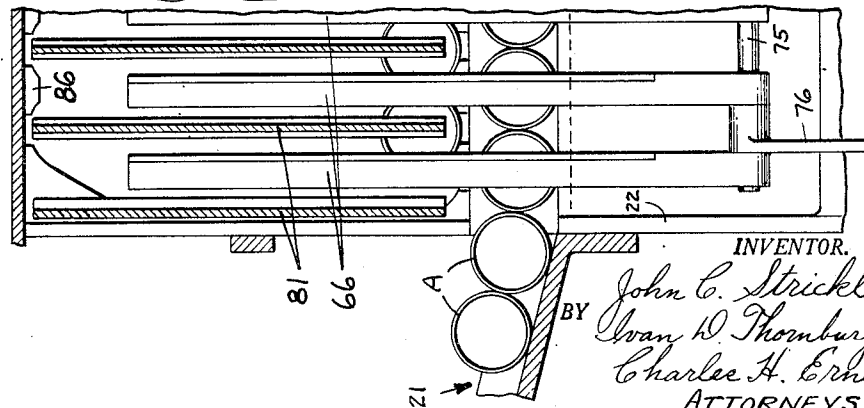


Fig. 12



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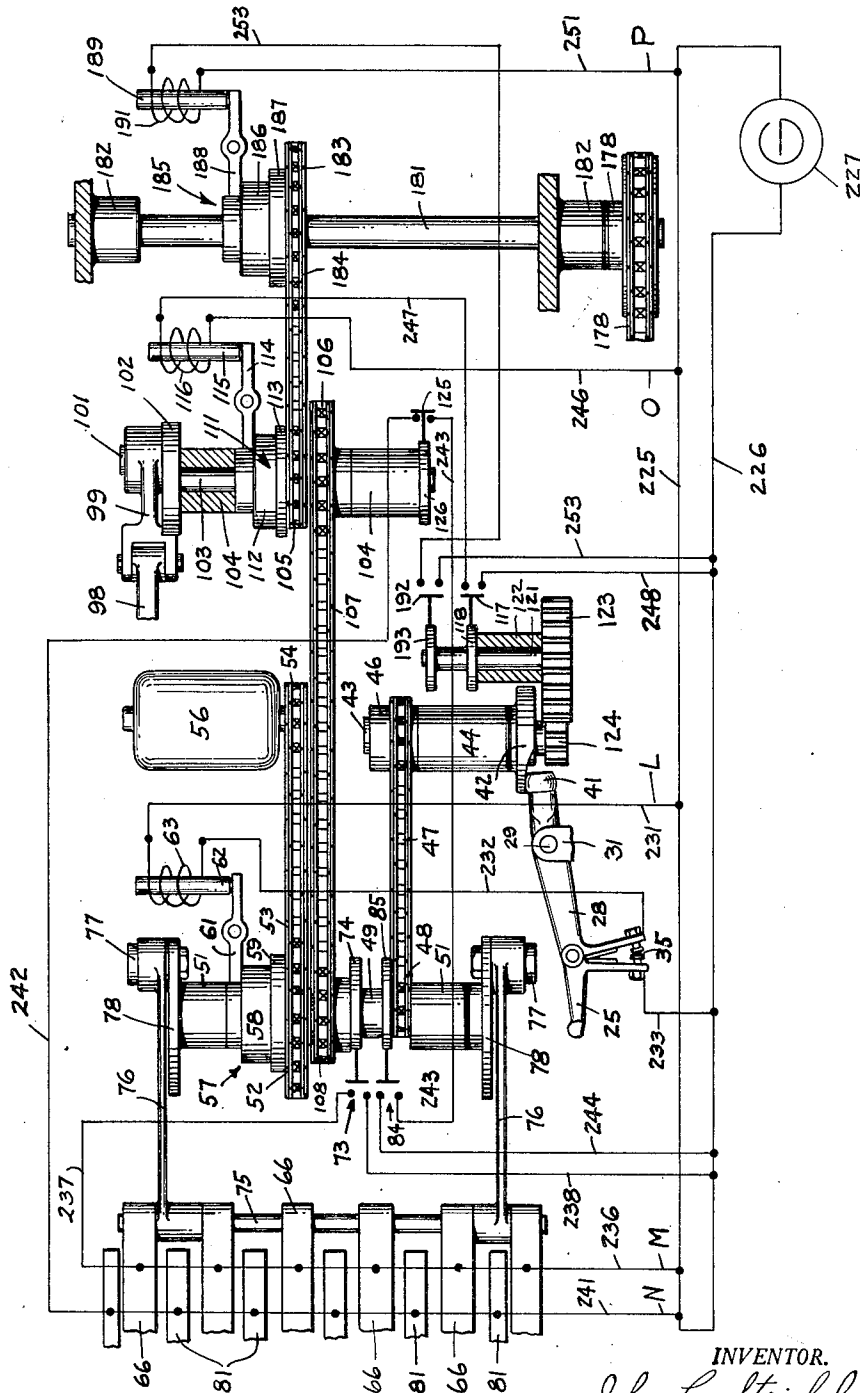
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MAGNETIC STACKING AND PACKAGING MACHINE FOR CANS

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Fig. 18



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## UNITED STATES PATENT OFFICE

2,544,735

MAGNETIC STACKING AND PACKAGING  
MACHINE FOR CANS

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corporation of New Jersey

Application May 17, 1945, Serial No. 594,218

15 Claims. (Cl. 226—15)

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The present invention relates to a machine for packaging metallic containers or cans for shipment and storage and has particular reference to magnetic devices for arranging the cans in a predetermined order for packaging.

In the can making industry certain kinds of cans, especially those of the "sanitary" or full open mouth type used for fruits and vegetables and other food products sometimes are sealed in large paper bags or packages, containing approximately two hundred cans, which protect the cans from contamination during shipment and storage.

For best results, cans packed in such paper bags or packages are arranged in a compact, relatively solid mass which can be handled without breaking. It has been found that by arranging the cans in a staggered relation before placing them in layers in the bag or package, better results are attained. However, the arranging of the cans in such a staggered relation presents considerable difficulties where high speed production requirements must be considered.

The instant invention contemplates overcoming these difficulties by providing a machine in which cans moving in a continuous procession are quickly arranged in proper relation and are placed within a package ready for sealing without manual handling and under high speed conditions.

An object of the invention is the provision of a machine for placing cans into fibre bags or packages in a compact arrangement wherein the cans are stacked in vertical contiguous rows in a predetermined relation and the entire arrangement of cans as a unit is shifted into place within the package and this is repeated for the desired number of layers of such units comprising the contents of each package.

Another object is the provision of such a machine wherein stationary and movable magnets operating in a synchronized order are utilized for stacking and holding the cans in a predetermined arrangement to make up a layer unit to be inserted in a package of such cans.

Another object is the provision in a machine of this character of devices receiving cans in a continuous procession and segregating them into rows of a predetermined number of cans, each row being located relative to a neighboring row to build up a compact, relatively solid layer of cans preparatory to insertion into the package as a unit.

Another object is the provision in such a machine of devices for inserting a separator sheet

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of fibre or other material between the layer units of cans as they are placed within the package to keep the cans of each layer unit separated.

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 a top plan view of a machine embodying the instant invention;

Figs. 2 and 3 are enlarged top plan and side views respectively of a gear detail used in the machine, with parts shown in section and parts broken away;

Fig. 4 is a perspective view drawn on a reduced scale of a package or bag filled with cans by the machine shown in Fig. 1;

Fig. 5 is a side view of the machine shown in Fig. 1, with parts broken away;

Fig. 6 is a front view of the machine, with parts broken away;

Figs. 7 and 8 are transverse sectional views taken substantially along the line 7—7 in Fig. 6 and showing the moving parts in different positions, parts being broken away;

Fig. 9 is a vertical longitudinal section taken substantially along the line 9—9 in Fig. 1, with parts broken away;

Fig. 10 is an enlarged perspective detail of one of the parts of the machine, with portions broken away;

Fig. 11 is a vertical transverse section taken substantially along the broken line 11—11 in Fig. 9, with parts broken away;

Figs. 12 to 17, inclusive, are diagrammatic views showing how cans are stacked vertically by the stacking elements of the machine; and

Fig. 18 is a diagrammatic view of the driving mechanism of the machine and a wiring diagram of the electric apparatus used in the machine.

As a preferred embodiment of the instant invention the drawings illustrate a machine in which sheet metal cans A (Fig. 4) are packed into large paper bags B to form a package for shipment and storage. The cans A are empty and have one end closed with an end member C (see Figs. 7 and 8). The cans shown are round in cross section but the invention is equally well adapted to other shapes of can.

In the machine the cans A are received in a horizontal position, i. e., lying on one side and are segregated into rows of a desired number of cans. Rows of equal numbers of cans may be segregated or rows of unequal numbers if desired, so that

they may be staggered or not staggered in the corresponding relation.

The rows of cans, as they are segregated are lifted vertically and arranged in position to form a compact, orderly mass or layer unit. When the unit is complete the entire mass is pushed horizontally into a mould D or package holding device which is surrounded by a paper bag or can package B. As each layer unit is deposited in the mould a fibre separator sheet E is inserted into place in front of the layer of cans. In this manner a plurality of layers of cans separated by fibre sheets E are built up in the mould until it is filled. When the mould D is filled the bag B with its load of cans is removed and sealed ready for shipment or storage.

The cans A advance into the machine in a continuous procession moving along an inclined runway 21 (Figs. 1, 6, 7, 8 and 11), the machine end of which is secured to a vertical frame 22 having an H shaped horizontal cross section which constitutes the main frame of the machine. In the machine the cans roll along a horizontal table or support 23 (Figs. 9 and 11) which is formed as an integral part of the main frame 22. This table is substantially as wide or deep as the height of the cans received thereon.

The number of cans on the table 23 constitute one row, as hereinbefore mentioned. The number of cans in the row and their location on the table is controlled by a stop arm or element 25 which is disposed adjacent the terminal end of the table, at the right as shown in Fig. 11. Where the cans are to be stacked in a stagger layout as shown in the drawings, the stop arm 25 reciprocates along the table a distance of one-half the diameter of a can and in shifted position stops alternate rows of cans one-half a diameter ahead of the inbetween rows. It is this locating of the cans that forms the staggered or nesting relation when the rows are lifted vertically into a stack.

The stop arm 25 is mounted loosely on a pivot pin 27 (Fig. 11) secured in the upper end of a vertical stop lever 28 carried on a rocker pin 29 secured in a pair of lugs 31 formed on the inner surface of one of the side wings of the main frame 22. The stop arm and the stop lever are formed with laterally extended lugs 33, 34 which carry aligned electric switch points constituting a switch 35 which is used, as will be hereinafter explained in connection with the wiring diagram in Fig. 18, to set in motion devices for lifting the located rows of cans into the stack. A wire spring 36 interposed between the lugs 33, 34 keeps the switch points in a normally separated position, the arm 25 then being positioned relative to the lever 28 as shown in Fig. 11.

The lower end of the stop lever 28 carries a cam roller 41 (Figs. 9, 11 and 18) which operates against an edge cam 42 mounted on a short jack shaft 43 carried in a bearing 44 formed on a transverse vertical web 45 of the main frame 22. The jack shaft is rotated by a sprocket 46 which is mounted on the inner end of the shaft. The sprocket is connected by a chain 47 to a driving sprocket 48 (see also Fig. 6) mounted on a main drive shaft 49 carried in a pair of spaced bearings 51 formed on the transverse web 45 of the main frame 22.

The main drive shaft 49 is rotated by a sprocket 52 (Fig. 6) carried loosely on the shaft. This sprocket is connected by a chain 53 to a driving sprocket 54 mounted on a rotor shaft 55 of a combined electric motor and speed reducer unit 56. The motor and speed reducer unit operate

continuously. The main drive shaft, however, is normally stationary and is rotated periodically by a suitable commercial one-revolution clutch 57 (Figs. 6 and 11) having a driving member 58 keyed to the drive shaft and a driven member 59 secured to the drive sprocket 52. The clutch is actuated by a pivotally mounted clutch finger 61 controlled by a movable element 62 of an electric solenoid 63 carried on the transverse web 45 of the main frame 22.

Hence when a full row of cans A is assembled on the table 23 as shown in Fig. 11, they create a pressure against the stop arm 25 sufficient to pivot the arm on its pin 27 against the resistance of its wire spring 36. This movement of the arm brings its switch contact against the switch contact of the stop lever 28 and this closes the switch 35. Closing of the switch energizes the main clutch solenoid 63 (Fig. 6) and this actuates the clutch finger 61 to throw in the clutch 57. The main drive shaft 49 thereupon begins its movement and rotates through one revolution after which it stops.

During the rotation of the main drive shaft 49 the cans A on the table are lifted vertically and the jack shaft 43 and the cam 42 carried thereon rotate through one-half revolution. This shifts the stop lever 28 inwardly, as hereinabove explained, to locate the next row of incoming cans in a position which is in staggered relation to the row just elevated. As soon as the row of cans being elevated has passed above the stop arm 25 and released the same, the spring 36 opens the switch 35 and this deenergizes the solenoid 63 to permit stopping of the main drive shaft at the end of its one revolution. This cycle is repeated for each row of cans to be elevated into stacked formation.

Lifting of the rows of cans is effected by a plurality of spaced and parallel, vertically disposed magnetic feed or lift bars 66 (Figs. 6, 7, 8, 9 and 10) which are located adjacent the front of the can table 23. These lift bars operate in vertical slideway grooves 67 formed in a retainer plate 68 which extends transversely across the front of the machine and at its ends is bolted to the main frame 22. This plate is made of non-magnetic material and confines the lift bars against displacement. It is mounted above the top edge of the transverse web 45 of the main frame.

Each lift bar 66 is of channel shape construction, as best shown in Fig. 10, and contains a plurality of electromagnets 71 which when energized set up a magnetic field adjacent the bars. A cover plate 72 secured to a side of each bar and forming a part thereof retains the magnets in place within the bar. Energization of the magnets is controlled by an electric switch 73 indicated in the wiring diagram in Fig. 18 and opened and closed at the proper time by a cam 74 carried on the main drive shaft 49.

At their lower ends, the lift bars 66 are tied together by a shaft 75 which extends through the ends of the bars. Intermediate the two outer pairs of lift bars, the shaft carries a pair of spaced and parallel arms 76. The lower ends of these arms are mounted on pivot studs 77 secured into eccentric discs 78 carried on the outer ends of the main drive shaft 49.

Hence when the main drive shaft 49 rotates through its one-revolution cycle it raises the lift bars through an upward or stacking stroke and then lowers them to their original position through a return stroke by the action of the

eccentric discs 78 and the arms 76. At the beginning of the stacking stroke, the switch cam 74 turning with the shaft immediately closes the electric switch 73 and thus energizes the electro-magnets 71. The energized magnets attract the cans A then resting on the table 23 and hold them with their open ends against the lift bars. As the lift bars rise through their stacking stroke, the row of cans, clinging to the lift bars is elevated above the table 23 to a position in front of the mould D. Here they are clear of the next row of incoming cans which immediately roll into place on the table as soon as the cans just lifted are out of the way.

At the end of the up or stacking stroke of the lift bars 66 and just before the bars start to return to their original lowered position, the magnetic hold on the row of elevated cans is transferred from the lifter bars to a plurality of intermediate T-shaped auxiliary magnetic holding plates 81. These plates retain the cans in their elevated position while the lift bars return. The holding plates 81 are disposed between the lifter bars in parallelism therewith. They extend vertically for the full height of the can mould D and are located directly in front of this mould.

The inner faces of the holding plates 81 are in a vertical plane and in one position are in the same vertical plane with the inner faces of the lifter bars 66. These plate inner faces are thus adjacent the open ends of the cans when the latter are lifted alongside the plates into their elevated position. The holding plates extend outwardly in the front of the machine a considerable distance beyond the lift bars as best seen in Figs. 7 and 9. The outer vertical edges of these plates are maintained in spaced relation by a plurality of rows of normally deenergized cylindrical electro-magnets 82. Tie rods 83 extend across the entire number of plates and are in the same vertical plane. Each rod passes through a row of the magnets and ties the plates together. The magnets are energized and deenergized by an electric switch 84 (Fig. 18) which is opened and closed at the proper time by an edge cam 85 (Fig. 18) mounted on the main drive shaft 49.

After a row of cans has been lifted and just before the lift bars 66 start to return to their original lowered position, the switch 84 is closed and the holding magnets 82 are energized. The magnetic fields set up in the faces of the holding plates 81 by these magnets hold the elevated cans against them. The magnets 71 in the lift bars are deenergized and thus release their hold on the cans. This is what constitutes the transfer of magnetic holding power from the bars to the plates as mentioned above. The cans then remain in their elevated position being held by the holding plates while the lift bars return to pick up another row of cans.

At the time the lift bars 66 return to fully lowered position, the main drive shaft 49 has just completed its one revolution cycle and both bars and shaft come to rest. This completes the cycle of operation of lifting one row of cans. If there are sufficient cans on the table 23 to make up a new row before the main drive shaft 49 completes its cycle, the pressure of the cans will close the stop switch 35 before the lift bars 66 have completed their return stroke and hence the clutch solenoid 63 will be already energized and the clutch finger 61 already actuated to start a new cycle just as soon as the old cycle is completed. In that event the main drive shaft does

not stop at the end of the cycle but continues on the new cycle as soon as the preceding cycle is completed. Hence if sufficient cans are available practically continuous operation of the machine may be had.

When the second row of cans is about to be elevated into position in front of the mould D, the magnets 82 in the holding plates 81 are deenergized simultaneously with the energizing of the magnets 71 in the lift bars 66. Hence the magnetic hold on the cans in the elevated first row is transferred from the holding plates 81 to the lift bars at the same time that the lift bars pick up the newly completed row of cans on the table. Thus when the lift bars move up through their second stacking stroke, they lift the bottom row of cans into the elevated position formerly occupied by the first row and simultaneously lift the first row to a still higher elevation.

Upon reaching these new elevations the magnetic holding power again is transferred from the lift bars 66 to the holding plates 81 by the deenergization of the magnets 71 and the energization of the magnets 82, as above explained. This leaves both rows of elevated cans suspended by the holding plates 81 and leaves the lift bars 66 free to return for another row.

Thereafter the lifting cycle is repeated and as shown by the diagrams in Figs. 12 to 17, inclusive, the rows of cans are progressively elevated and stacked, the mass of cans alternately clinging to the holding plates 81 and to the lifting bars 66. It should be noted that all rows of cans move upwardly in spaced relation for the first few lifting actions.

In the instant case, where six rows of cans make up the full layer unit, this spaced lifting takes place for the first four rows. The top row of cans reaches the top of the mould (Fig. 16) before the end of the fifth stacking stroke of the lift bars 66. Overhanging guide bars or can stop elements 86 forming the roof of the mould D prevent the full lifting effect of the lift bars on the cans at this time and hold the top row of cans in proper position. On this stroke the second row down from the top engages against the top row and comes into proper staggered relation therewith during the upward travel of the lift bars on this stroke. This is brought about by the rising lift bars 66 slipping along the cans which have been prevented from upward movement by the bars 86. On the sixth stacking stroke of the lift bars (Fig. 17) the spaces between the remaining rows of cans are completely closed as the moving rows progressively engage against the stopped rows. In this way the full assemblage of a layer unit of cans sufficient to fill the mold D is completed.

Transfer of the assembled layer unit of cans A into the mould D is brought about by a longitudinal horizontal movement of the holding plates 81 while the lift bars 66 are returning to their lowered position after delivering the sixth row of cans to the holding plates. For this purpose the two outer holding plates, one on each side of the machine, are equipped with slide brackets 88 (Figs. 5 to 9 and 11). These brackets have longitudinal slideways 89 in which stationary gibs 91 (see also Figs. 7, 8 and 11) are located. Gibs 91 are formed on the outer surfaces of the two side frames of the main frame 22 and provide tracks along which slide the brackets 88.

The slide brackets 88 are connected by links

93 (Figs. 5, 6, 7, 8 and 11) to the upper ends of a pair of vertically disposed levers 94 which are mounted on the ends of a rocker shaft 96. This shaft extends across the machine and is carried in bearings 97 formed in the main frame 22. Within the frame, the rocker shaft carries an arm 98 (see Figs. 9, 11 and 18) having its outer end pivotally connected to a crank 99 mounted on a pivot stud 101 secured in an eccentric disc 102. The disc is mounted on a short shaft 103 carried in a pair of spaced bearings 104 formed on the transverse web 45 of the main frame 22.

The short shaft 103 is normally stationary but once for every layer unit of cans formed in the stacker section of the machine, the shaft is rotated through a one revolution cycle. For this purpose the shaft carries a loose hub having formed thereon a small sprocket 105 (Figs. 11 and 18) and a large sprocket 106. The large sprocket is connected by a chain 107 to a driving sprocket 108 mounted on the main drive shaft 49 adjacent the driving sprocket 52.

Connection between the short shaft 103 and the sprocket 106 for rotating the shaft is effected by way of a suitable one-revolution clutch 111 (Fig. 18) similar to the drive shaft clutch 57 hereinbefore described. The clutch 111 includes a driving element 112 keyed onto the short shaft and a driven element 113 formed on the small sprocket 105. The clutch is operated by a pivoted clutch finger 114 which is actuated by a movable element 115 of a normally deenergized electric solenoid 116 mounted on the transverse web 45 of the main frame 22.

Energization of the clutch solenoid 116 is brought about by an electric switch 117 (Fig. 18) which is opened and closed at the proper time by an edge cam 118. The cam is mounted on a stub shaft 121 carried in a bearing 122 formed on the transverse web 45 of the main frame 22. The shaft is periodically rotated by a gear 123 (see also Figs. 9 and 11) which is mounted on the outer end of the shaft and which meshes with a pinion 124 mounted on the outer end of the jack shaft 43. The gear 123 is designed to make one revolution for each layer unit of cans, six rows while the gear pinion 124 makes one half revolution for each row of cans elevated.

Hence when a full layer unit of cans has been stacked in position in front of the mould D, by the combined action of the lift bars 66 and the holding plates 81, the gear 123 has been rotated sufficiently to move the cam 118 which in turn closes the switch 117. The energizes the clutch solenoid 116 and thus throws in the clutch 111. This operation of the clutch rotates the short shaft 103 through one revolution before the clutch again becomes disconnected.

During this revolution of the short shaft, the eccentric 102 mounted thereon through its described connections with the holding plates 81, shifts the plates horizontally as mentioned above through a can pushing stroke. This deposits the mass of cans clinging to the plates into the mould D as a layer unit. The holding plates move the cans into the mould from the position shown in Fig. 7 to that shown in Fig. 8, which distance is equal to the length of the cans plus a slight overthrow for clearance purposes.

When the layer unit of cans is fully within the mould, as when the holding plates 81 reach the innermost extent of their pushing stroke, the magnets 82 are deenergized. This deener-

gizing of the magnets releases the cans from the holding plates, the cans becoming seated in the mould. The deenergizing of the magnets is effected by the opening of a normally closed electric switch 125 (Fig. 18) which is controlled by an edge cam 126 (see also Fig. 11) carried on the inner end of the short shaft 103.

As soon as the cans are released from the holding plates 81, these plates move outwardly through a return stroke and come to rest in their original position adjacent the lift bars 66. They remain in this position while cooperating with the lift bars in building up another layer unit of cans for the subsequent insertion into the mould.

The can mould D comprises the overhanging guide bars 86 and a plurality of horizontally disposed plates 131 and two corner members 132 (see Figs. 9 and 11). The inner ends of the plates and corner members are secured to the main frame 22. These plates and members are arranged so as to surround and set off a rectangular area which is substantially equal to that occupied by the full number of cans to be packed into a paper bag B. The plates and corner members are disposed in spaced and parallel relation with their edges beveled and curved so as to fit and properly hold the cans of each layer unit in their staggered and nested relation. The two corner members 132 are located in diagonally disposed corners and are formed with interior locating surfaces 133 to fit the can pattern, as best shown in Figs. 9, 11 and 17.

The outer ends of the mould plates 131 and corner members 132 project beyond the machine frame for a distance equal to the depth of the bag B into the cans are to be packed. The bag is stretched over this mould, as best shown in Fig. 1, either while the mould is being filled or after it is filled. Hence when the mould is filled with cans, by the repeated pushing movement of the holding plates 81 as has been explained, the bag or package with its load of cans may be rapidly stripped off in any suitable manner and carried away for sealing to condition it for shipping or storage.

As each layer unit of cans A is placed within the mould D a sheet E of fibre, as for example heavy paper or cardboard, is placed in the mould adjacent one face of the cans. This sheet serves as a spacer or separator element to keep the layers of cans separated to avoid damage to the cans and prevent their shifting out of place while in the bag.

The separator sheet E is cut off from a roll F (Figs. 1, 5 and 9) of fibre strip stock supported on an axle 135 the ends of which are carried in a pair of brackets 136 secured to the main frame 22. The strip of fibre from the roll extends vertically toward the top of the machine adjacent the outer ends of the holding plates 81, and is supported on a pair of spaced flanged idler rollers 141, 142 which extend across the machine. The rollers 141, 142 are mounted on idler shafts 143 carried in bearings 144 formed in side brackets 145 (see also Fig. 11) bolted to the top of the main frame 22. There is a bracket on each side of the machine.

The leading end of the strip of fibre extends between a pair of normally stationary feeding rollers 148, 149 mounted on respective shafts 151, 152 which extend across the machine. The shaft 151 is carried in bearings 153 formed in the side brackets 145. The roller 149 serves as a

pressure roller and its shaft 152 is carried in a pair of slide blocks 154 mounted in slideways 155 formed in auxiliary brackets 156 bolted to the top of the main frame 22 adjacent the brackets 145. Adjusting screws 157 carried in the auxiliary brackets and engaging against the slide blocks provide for adjusting the pressure exerted by the roller 149 against the strip of fibre as it is fed by the feed rollers.

In operation the feed rollers 148, 149 feed the leading end of the strip of fibre down in front of the mould D into the space between a layer unit of cans in the mould and a layer unit of cans being stacked by the combined action of the lift bars 66 and the holding plates 81. To feed the strip the feed rollers are rotated in unison by a pair of meshing spur gears 161, 162 mounted on the ends of the roller shafts 151, 152.

The feed rollers 148, 149 are driven by an interrupted gear mechanism which permits interruption of the feeding action while the separator sheet E is cut off. This mechanism includes a tight gear 163 (Figs. 1, 2 and 3) which is keyed to the feed roller shaft 151 and a loose gear 164 which is semi-loosely mounted on the shaft adjacent the tight gear. A collar 165 pinned to the end of the shaft keeps the loose gear in place thereon. The loose gear is formed with a curved slot 166 and a pin 167 secured in the tight gear 163 projects into the slot and limits the amount of rotative movement relative to the tight gear, as will be explained hereinafter.

A conventional hand brake 168 surrounds the hub of the tight gear and applies a pressure thereon to hold the feed rollers normally stationary. This stops rotation of the rollers at the termination of a sheet feeding operation. This brake is secured by a stud 169 to the adjacent side bracket 145.

The interrupted gear mechanism also includes a mutilated drive gear 171 having two adjacent toothless recessed areas 172, 173 formed in its periphery, as best shown in Figs. 2 and 3. Such a gear cooperates with and drives the tight and loose gears 163, 164 at certain periods. The mutilated gear 171 is mounted on one end of a cross shaft 175 (see also Fig. 11) which is carried in bearings 176 formed in the side brackets 145. The opposite end of the cross shaft carries a sprocket 177 (see also Fig. 5) which is driven by a chain 178 which extends down alongside the main frame 22. At the bottom chain 178 operates over a sprocket 179 mounted on a sprocket shaft 181.

The sprocket shaft 181 (Fig. 11) extends across the machine and is carried in bearings 182 formed in the main frame 22. This shaft carries a driving sprocket 183 which is loose on the shaft and which is rotated by a chain connection 184 with the small sprocket 105 on the can pusher short shaft 193.

The sprocket shaft 181 is normally stationary but is rotated through a one-revolution cycle once for every layer unit of cans A inserted into the mould D. Rotation of the shaft is effected through a suitable one-revolution clutch 185 (Figs. 11 and 18) which is similar to the other two clutches 57, 111 hereinbefore explained. The clutch 185 includes a driving member 186 keyed onto the sprocket shaft and a driven member 187 formed on the sprocket 183. The clutch is operated by a pivotally mounted clutch finger 188 which is actuated by a movable element 189 of a normally deenergized electric solenoid 191

mounted on the transverse web 45 of the main frame 22.

Energization of the clutch solenoid 191 is brought about by the operation of an electric switch 192 (Fig. 18) which is opened and closed at the proper time by an edge cam 193. The cam is mounted on the inner end of the stub shaft 121.

The speed relation between the sprocket shaft 181 and the feed rollers 148, 149 is such that a length of the strip of fibre required to provide a separator sheet E is fed into place adjacent the layer unit of cans in the mould B during a partial rotation of the sprocket shaft. During the remainder of the one-revolution cycle of the sprocket shaft, the separator sheet F is severed from the strip.

During the separator sheet cutting operation the feed rollers 148, 149 come to rest while the sprocket shaft 181 continues to rotate and they remain stationary until the next cycle of operation of the sprocket shaft. This stopping of the feed rollers is effected by the mutilated gear 171, as during its rotation by the sprocket shaft, it brings the toothless, recessed area 172 into position adjacent the tight gear 163 on the feed roller shaft 151. This recessed area extends half way across the face of the mutilated gear 171 so that during the passage of this area past the tight gear 163, the latter gear will not be rotated but the loose gear 164 will continue to rotate. It is this halting of the tight gear 163 that stops the feeding action of the feed rollers.

During the continued rotation of the loose gear 164 with the mutilated gear 171, while the tight gear 163 remains stationary, the curved slot 166 in the loose gear is rotated so that its leading end moves away from the pin 167 in the now stationary tight gear. Rotation of the loose gear continues until the trailing end of the curved slot 166 comes into engagement with the pin 167. This is the end of the cycle of operation of the sprocket shaft 181. However, the length of the curved slot 166 is such that contact of the pin 167 with the trailing end of the slot, brings the gear teeth of the loose gear 164 into transverse alignment with the teeth on the tight gear 163.

Hence upon rotation of the mutilated gear 171 at the beginning of the next following cycle of operation, the teeth of this gear at the trailing end of the recessed area 172 will properly mesh with the teeth on the stationary tight gear 163 and thus will pick up or start rotating this gear in the proper timed relation.

The mutilated gear 171 disengages the loose gear 164 at the same time it picks up the tight gear 163 to effect the rotation of the feed rollers 148, 149 for the feeding of a subsequent separator sheet E. This disengagement is brought about by the bringing of the toothless, recessed area 173 of the mutilated gear into place adjacent the loose gear. While this recessed area is passing the loose gear, there is no engagement between the loose gear and the mutilated gear. Hence the loose gear temporarily stops rotating.

During this stationary period of the loose gear, the pin 167 in the now rotating tight gear 163 travels along the curved slot in the loose gear and thus moves away from the trailing end of the slot toward the leading end. When the pin engages the leading end of the slot, the loose gear is again in its original position adjacent the tight gear, with the teeth of both gears in transverse alignment. Hence when the teeth of the mutilated gear 171

lated gear 171 again come into engagement with the loose gear they will be in proper meshing position. In this manner temporary halting of the feed rollers 148, 149 may be brought about with continued operation of the driving gears.

While the feeding rollers 148, 149 and the strip of fibre is at rest, after a predetermined length of the strip has been fed into position to provide a separator sheet E, the sheet is cut off. This is effected by a movable cut-off knife 195 (Fig. 9) cooperating with a stationary cut-off knife 196 located directly below the feeding rollers and between which the strip passes. The ends of the stationary knife are secured in the auxiliary brackets 156. The ends of the movable knife 195 are bolted to slide blocks 197 (see also Fig. 11) which operate in horizontal slideways 198 formed in the brackets 145.

The movable knife 195 is actuated through a forward or cutting stroke (toward the right as viewed in Fig. 9) and thence through a return stroke by a pair of swing arms 201 located one adjacent the inner face of each of the brackets 145. These swing arms are mounted on a cross shaft 202 the ends of which are carried in bearings 203 formed in the brackets 145. The swing arms extend down adjacent the slide blocks 195 and are formed with forked ends or clevises 204 which straddle actuating pins 205 secured in the slide blocks.

Intermediate its length one of the swing arms 201 carries a cam roller 208 which operates against an edge cam 209 mounted on and rotated with the mutilated gear shaft 175. Springs 211 carried on pins 212 secured in the brackets 145 connect with the slide blocks 197 and keep the cam roller 208 in engagement with its cam 209. It is this cut off mechanism that severs the separator sheet E from the strip. After severance the sheet falls into place in the can mould D in front of the adjacent layer of cans therein in readiness to receive the next layer unit when that unit is assembled in the stacking portion of the machine.

Reference should now be had to the wiring diagram shown in Fig. 18. In the machine the various electric devices are supplied with electric energy by way of a main lead wire 225 and a return lead wire 226 which connect with opposite sides of a suitable supply of electric energy, such as a generator 227.

Setting of the machine in motion to stack the rows of cans into position as each row is assembled on the machine table 23 is effected by a circuit L which includes the normally open stop switch 35 and the normally deenergized clutch solenoid 63. When the stop switch 35 is closed, electric energy from the generator 227 flows along main lead wire 225, a connecting wire 231, solenoid 63, a connecting wire 232, closed switch 35, a connecting wire 233 to the return lead wire 226. Electric energy passing along this circuit energizes the clutch solenoid 63 which actuates the main shaft clutch 57 (Fig. 6).

Energization and deenergization of the electromagnets 71 in the lift bars 66 is effected through a circuit M which includes the cam operated normally open switch 73. When the switch 73 is closed electric energy from the main lead wire 225 passes along a connecting wire 236, the magnets 71, a connecting wire 237, closed switch 73, returning by way of a connecting wire 238 to the return lead wire 226. Electric energy passing along this circuit energizes the magnets 71. When the switch 73 is opened by the cam 74 the

circuit is broken and the magnets become deenergized.

The magnets 82 of the holding bars 81 are energized and deenergized at the proper time by a circuit N which includes the cam operated normally open switch 84 and the normally closed breaker switch 125. When the cam switch 84 is closed electric energy from the main lead wire 225 passes along a connecting wire 241 through the magnets 82, along a connecting wire 242, through the breaker switch 125, a wire 243, cam switch 84, returning by a wire 244 to the return lead wire 226. Electric energy passing along this circuit energizes the magnets 82. It is this energy that is utilized to hold the cans on the holding bars 81 while the lift bars 66 return to pick up and elevate the rows of cans from the machine table 23. When the cam switch 84 is opened the circuit is broken and the magnets 82 thereupon become deenergized. This is done to release the cans to the lift bars 66 so that they may be elevated, as hereinbefore explained.

This electric energy passing along the circuit N is also utilized to hold the cans on the holding bars 81 while they are being inserted into the can mould D. In this case, however, the circuit is broken earlier in the stacking cycle so that the cans will be released when deposited in the mould. This is brought about before the regular opening of the can switch 84 and is effected by the opening of the breaker switch 125.

Horizontal movement of the holding bars 81, brought about by actuation of the clutch 111 and the resulting rotation of the short shaft 103 is effected by a circuit O which includes the normally deenergized clutch solenoid 116 and the cam operated normally open switch 117. When the switch 117 is closed, electric energy from the main lead wire 225 passes along a connecting wire 246, through the solenoid 116, a wire 247, switch 117, and a connecting wire 248 returning to the return lead wire 226. It is the electric energy that passes along this circuit that energizes the clutch solenoid 116 and thereby through the one-revolution clutch 111 sets the short shaft 103 in motion. Opening of the cam switch 117 occurs before the end of the one-revolution cycle of the short shaft 103, and thereby deenergizes the solenoid before the end of the cycle to insure completion of only one cycle.

The separator sheet cutting off movement effected by the clutch cam 185 and the sprocket shaft 181 is brought about through a circuit P which includes the normally deenergized clutch solenoid 191 and the cam operated normally open switch 192. When the switch 192 is closed electric energy from the main lead wire 225 passes along a connecting wire 251, through the clutch solenoid 191, and returning by a wire 253 to the return lead wire 226. Electric energy passing along this circuit energizes the clutch solenoid 191 and thus throws in the cut-off clutch 185 for a one-revolution cycle. Before the completion of this cycle the switch 192 opens, and this deenergizes the solenoid 191 and thus permits of the stopping of the sprocket shaft 181 at the end of the cycle. This completes the wiring diagram.

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. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, magnetic means movable relative to said support for moving containers from said support into a position adjacent said package holding means, auxiliary magnetic means for holding the containers in their displaced position until a unit of a plurality of the containers is assembled adjacent said package holding means, means for moving the unit of containers from its assembled position into the package held by said package holding means, and means for rendering said magnetic means effective to release said containers after moving the containers into the sphere of influence of said auxiliary magnetic means.

2. In a machine for packaging metallic containers, the combination of a support for the containers, movable stop means disposed adjacent said support for engaging and aligning successive rows of containers on the support in relatively offset positions to effect a staggered row layout relation of the containers, means for holding a package to receive said containers, magnetic means movable relative to said support for elevating successive rows of containers from said support into a position adjacent said package holding means, auxiliary magnetic means for holding the containers in their elevated position until a unit of a plurality of the containers is assembled adjacent said package holding means, and means for moving said auxiliary magnetic container holding means to shift the elevated unit of containers from its assembled position into the package held by said package holding means.

3. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, magnetic means movable relative to said support for elevating containers from said support into a position adjacent said package holding means, auxiliary magnetic means for holding the containers in their elevated position until a unit of a plurality of containers is assembled adjacent said package holding means, means for moving said auxiliary magnetic container holding means to shift the unit of containers from its assembled position into the package held by said package holding means, means for feeding a strip of sheet material into position between units of containers inserted into the package, and means for severing from said strip a separator sheet for the unit of containers in the package.

4. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, electro-magnetic means movable relative to said support for elevating containers from said support into a position adjacent said package holding means, auxiliary electro-magnetic means for holding the containers in their elevated position until a unit of a plurality of the containers is assembled adjacent said package holding means, means for energizing and deenergizing said electro-magnetic means and said auxiliary electro-magnetic means in time with the movement of said containers to transfer the magnetic holding power from one of said means to the other to effect

the assemblage of said containers adjacent said package holding means, and means for moving said auxiliary magnetic container holding means to shift the unit of elevated containers from its assembled position into the package held by said package holding means.

5. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, magnetic feed means movable relative to said support for moving containers from said support into a position adjacent said package holding means, auxiliary magnetic feed means for holding the containers in their displaced position until a unit of a plurality of the containers is assembled adjacent said package holding means, means for moving the unit of containers from its assembled position into the package held by said package holding means, means for deenergizing said magnetic feed means after the containers have been engaged by said magnetic holding means, and means for effecting the moving of the assembled unit of containers in time with the assemblage of the containers into the unit.

6. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a magnetic feed bar movable relative to said support for elevating containers from said support into a position adjacent said package holding means, an auxiliary magnetic plate disposed adjacent the path of travel of said magnetic bar for holding the containers in their elevated position until a unit of a plurality of containers is assembled adjacent said package holding means, and means for moving the elevated unit of containers from its assembled position into the package held by said package holding means.

7. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a plurality of magnetic feed bars movable relative to said support for shifting rows of containers from said support into a position adjacent said package holding means, a plurality of auxiliary magnetic plates disposed adjacent and between said magnetic bars and engageable with the rows of shifted containers for holding them in a predetermined shifted position until a unit of a plurality of rows or containers is assembled adjacent said package holding means, and means for shifting the unit of containers from its assembled position into the package held by said package holding means.

8. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a feed bar movable relative to said support for elevating containers from said support into a position adjacent said package holding means, magnetic means on said feed bar for holding the containers in engagement with said feed bar during the elevating movement, a holding plate disposed adjacent the path of travel of said feed bar for holding the containers in their elevated position until a unit of a plurality of containers is assembled adjacent said package holding means, other magnetic means on said holding plate for holding the containers thereon during the assembling of said containers, and means for shifting said holding plate with its unit of containers from

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its assembled position into the package engaged by said package holding means.

9. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a plurality of feed bars movable relative to said support for shifting rows of containers from said support into a position adjacent said package holding means, a plurality of electro-magnets disposed within each of said feed bars for setting up a magnetic field in said feed bars to hold the containers on the bars during the shifting movement, a plurality of holding plates disposed adjacent and between said feed bars for receiving and holding the rows of shifted containers in their shifted position to build up a unit of a plurality of rows of containers, a plurality of electro-magnets disposed between said holding plates for setting up a magnetic field therein to hold the containers on the bars, and means for shifting the unit of containers from its assembled position into the package held by said package holding means.

10. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a plurality of feed bars movable relative to said support for shifting rows of containers from said support into a position adjacent said package holding means, a plurality of electro-magnets disposed within each of said feed bars for setting up a magnetic field in said feed bars to hold the containers on the bars during the shifting movement, a plurality of holding plates disposed adjacent and between said feed bars for receiving and holding the rows of shifted containers in their shifted position to build up a unit of a plurality of rows of containers, a plurality of electro-magnets disposed between said holding plates for setting up a magnetic field therein to hold the containers on the plates, means including a source of electric energy and electric switches connecting with said magnets for alternately shifting the holding power of said magnets between said bars and said plates for the shifting and holding of said containers to assemble them into a unit, and means for shifting the unit of containers from its assembled position into the package held by said package holding means.

11. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, a plurality of feed bars movable relative to said support for shifting rows of containers from said support into a position adjacent said package holding means, a plurality of electro-magnets disposed within each of said feed bars for setting up a magnetic field in said feed bars to hold the containers on the bars during the shifting movement, a plurality of holding plates disposed adjacent and between said feed bars for receiving and holding the rows of shifted containers in their shifted position to build up a unit of a plurality of rows of containers, a plurality of electro-magnets disposed between said holding plates for setting up a magnetic field therein to hold the containers on the bars, and means for shifting said holding plates with a unit of containers clinging thereto for positioning said containers into the package held on said package holding means.

12. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to re-

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ceive said containers, a plurality of feed bars movable relative to said support for shifting rows of containers from said support into a position adjacent said package holding means, a plurality of electro-magnets disposed within each of said feed bars for setting up a magnetic field in said feed bars to hold the containers on the bars during the shifting movement, a plurality of holding plates disposed adjacent and between said feed bars for receiving and holding the rows of shifted containers in their shifted position to build up a unit of a plurality of rows of containers, a plurality of electro-magnets disposed between said holding plates for setting up a magnetic field therein to hold the containers on the plates, means for shifting said holding plates with a unit of containers clinging thereto for positioning said containers into the package held on said package holding means, and means for releasing the containers from said holding plates after positioning in said package.

13. In a machine for packaging metallic containers, the combination of a support for the containers, means for holding a package to receive said containers, magnetic feed means movable relative to said support for moving containers from said support into a position adjacent said package holding means, auxiliary magnetic feed means for holding the moved containers in their displaced position until a unit of a plurality of the containers is assembled adjacent said package holding means, means for moving said auxiliary magnetic feed means with a unit of containers held thereby for positioning said containers into the package held on said package holding means, and means for disengaging said first mentioned magnetic means from the containers after engagement of said auxiliary magnetic means therewith.

14. In a machine for packaging metallic containers, the combination of a support for the containers, a movable stop element disposed adjacent said support, means for moving said stop element relative to said support for engaging and aligning successive rows of containers on the support in relatively offset positions to effect a staggered row layout relation of the containers to be packaged, means for holding a package to receive said containers, magnetic means movable relative to said support for elevating successive rows of containers from said support into a position adjacent said package holding means, auxiliary magnetic means for holding the containers in their elevated position until a unit of a plurality of the containers is assembled adjacent said package holding means, and means for moving said auxiliary magnetic container holding means to shift the unit of elevated containers from its assembled position into the package held by said package holding means.

15. In a machine for packaging metallic containers, the combination of a frame, means adjacent said frame for introducing containers into the machine in a continuous procession, a table support on said frame for supporting a row of containers, a pair of cooperating magnetic members independently movable relative to each other respectively for elevating containers from said table support to progressively raised positions, and for holding the elevated containers in their elevated positions for assembling a plurality of containers into a compact unit mass arranged in a predetermined pattern, a mould disposed adjacent said lifting and holding members for receiving a unit mass of said contain-

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ers, said mould supporting a package for receiving said containers, and means for moving said magnetic container holding member relative to said lifting element to insert the unit mass of containers held thereby into said mould.

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