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PACKING MACHINES

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FIG. 11

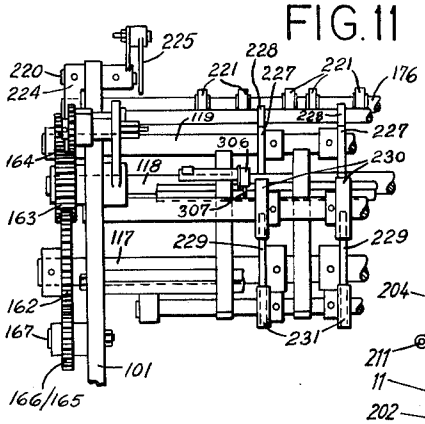


FIG. 1

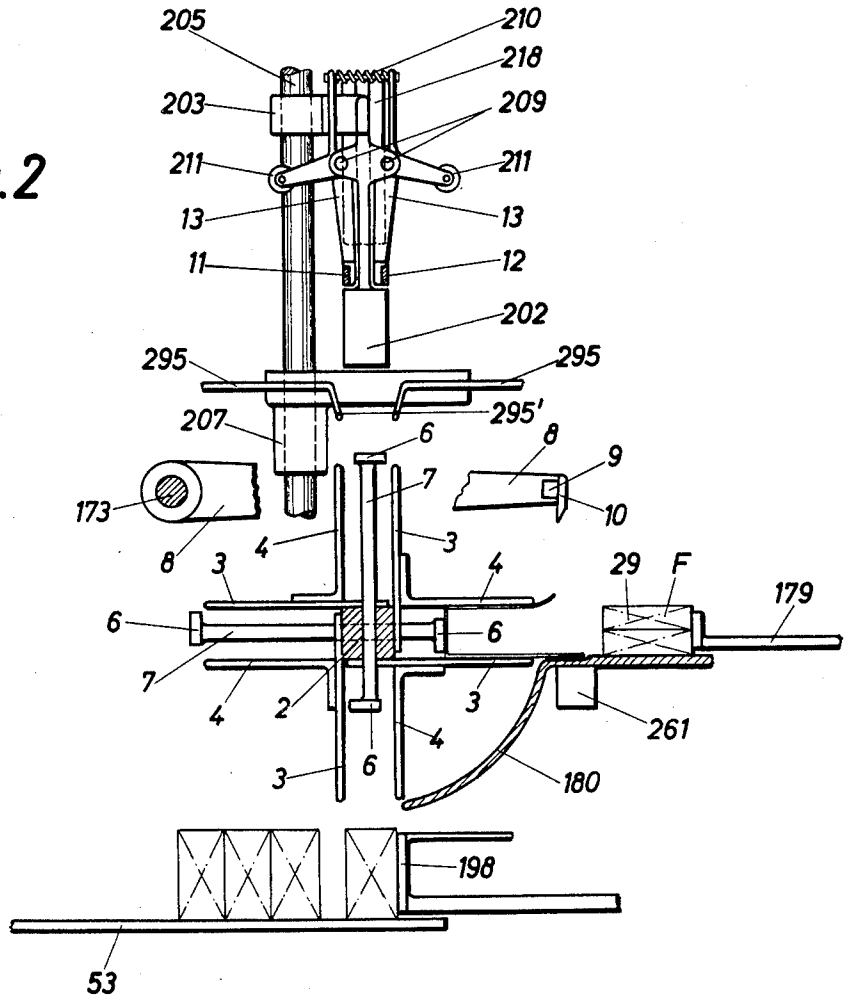
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May 31, 1966 E. BEERMANN ETAL 3,253,385

PACKING MACHINES

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Fig. 2



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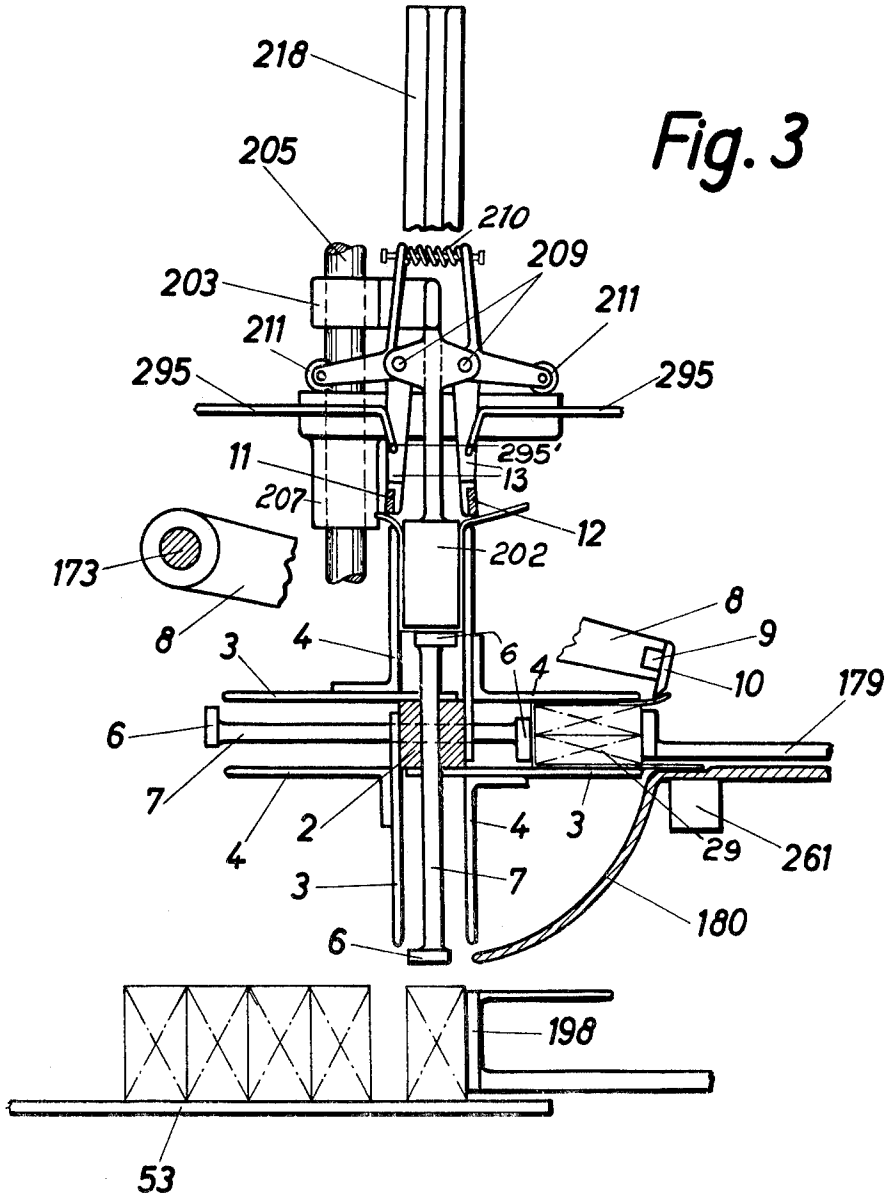


Fig. 3

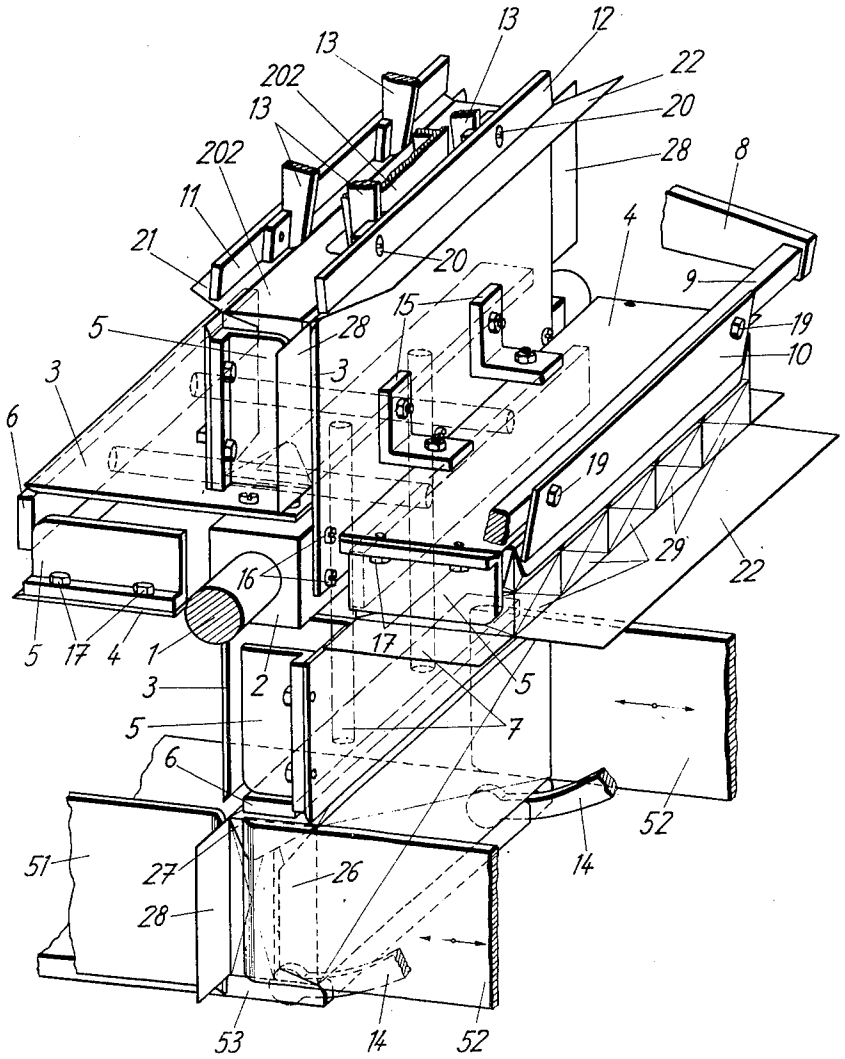
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PACKING MACHINES

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Fig. 4



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Fig. 5

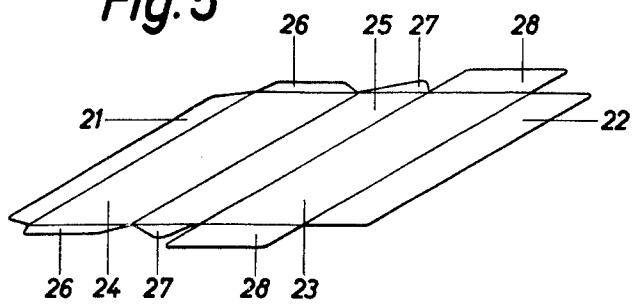


Fig. 6

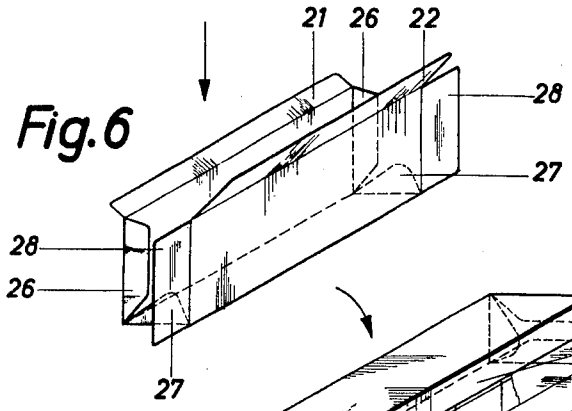
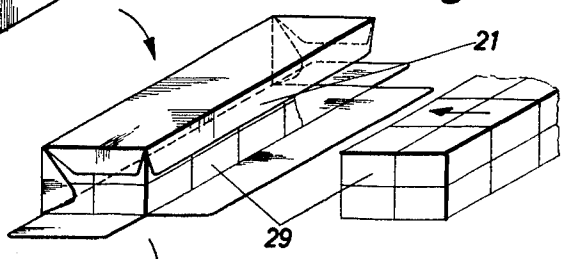


Fig. 7



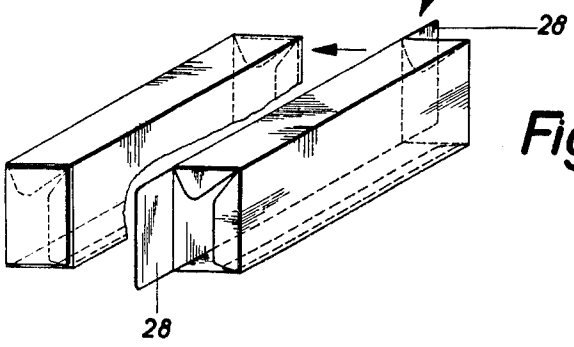


Fig. 8

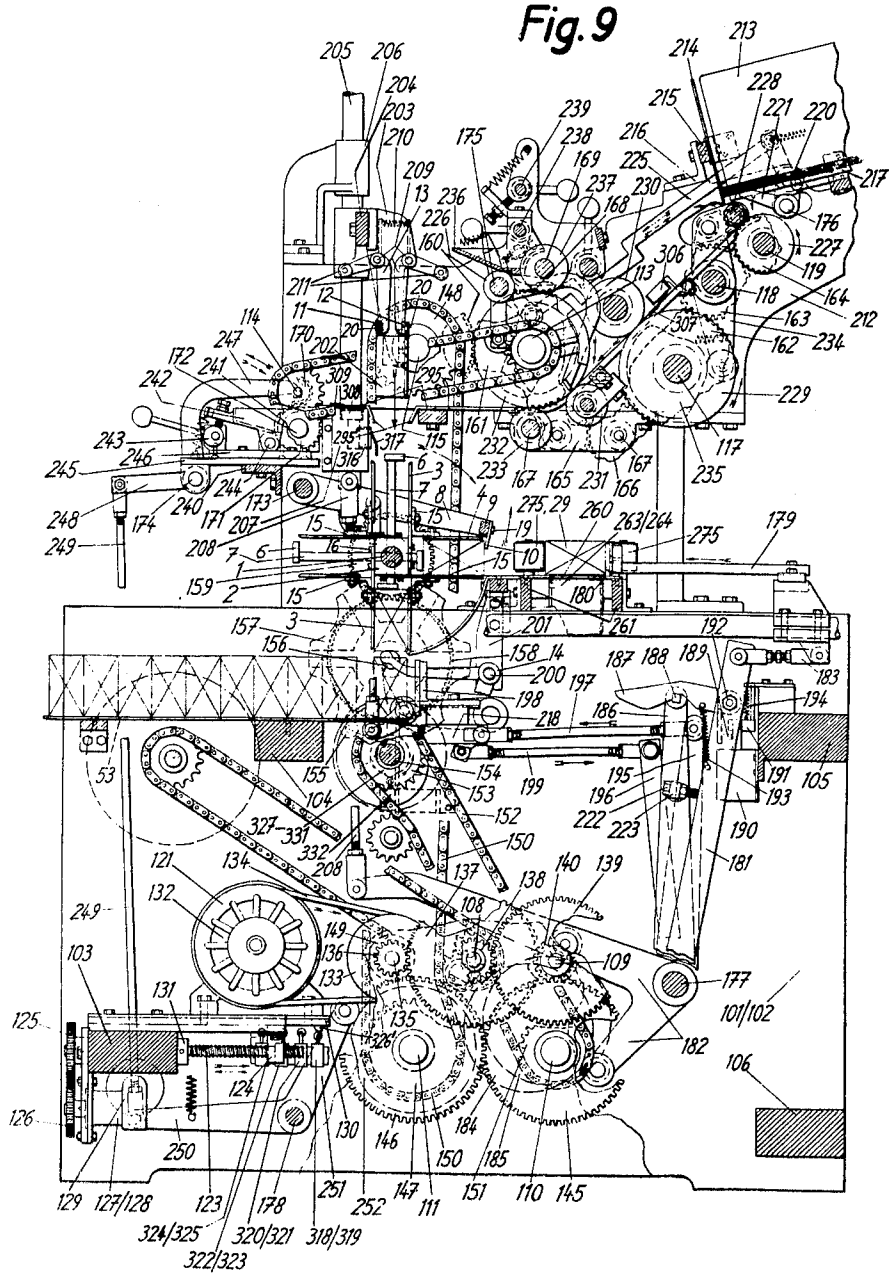
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PACKING MACHINES

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Fig. 9



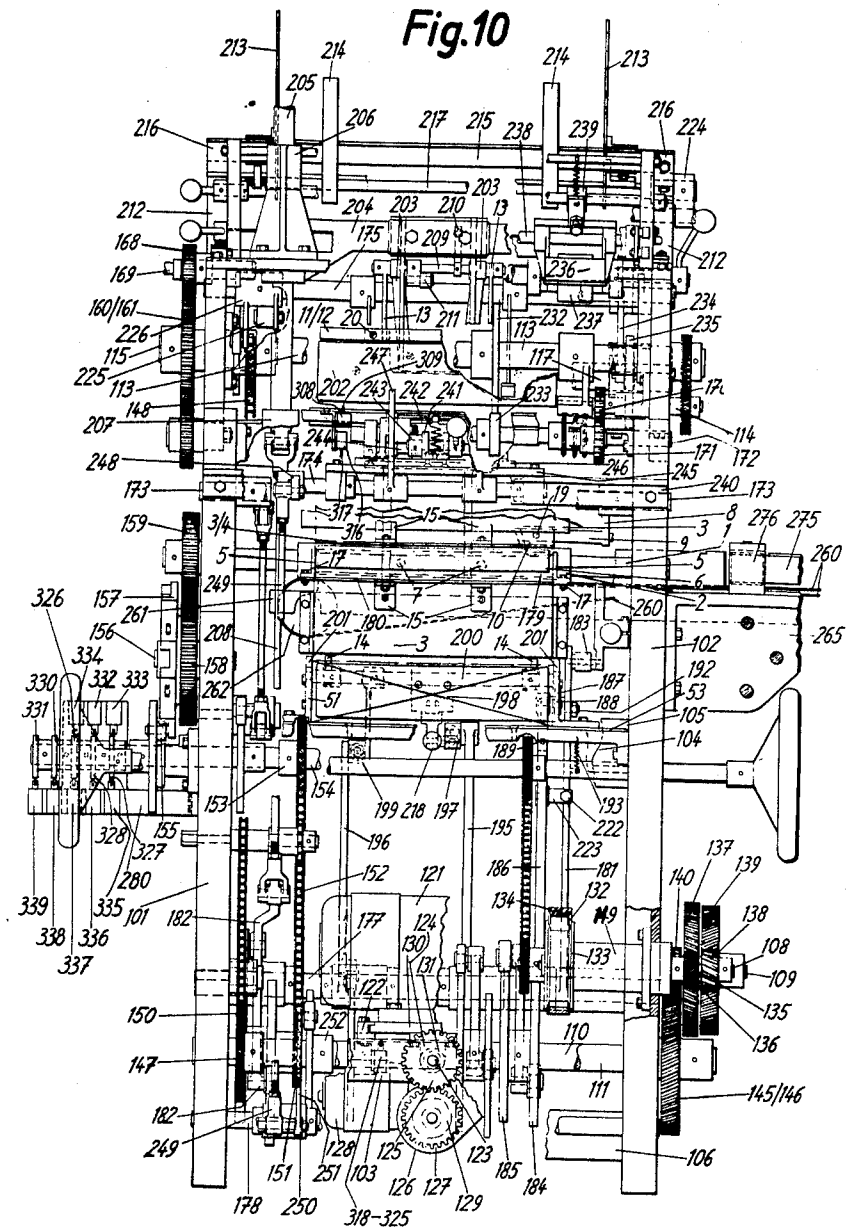
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Fig.10



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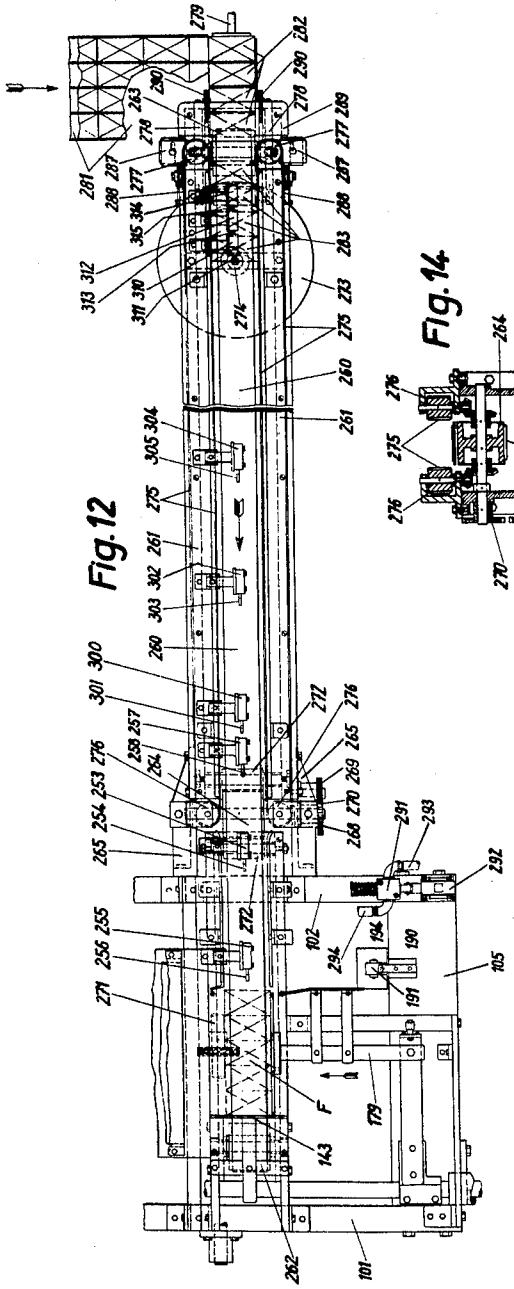


Fig. 12

Fig. 14

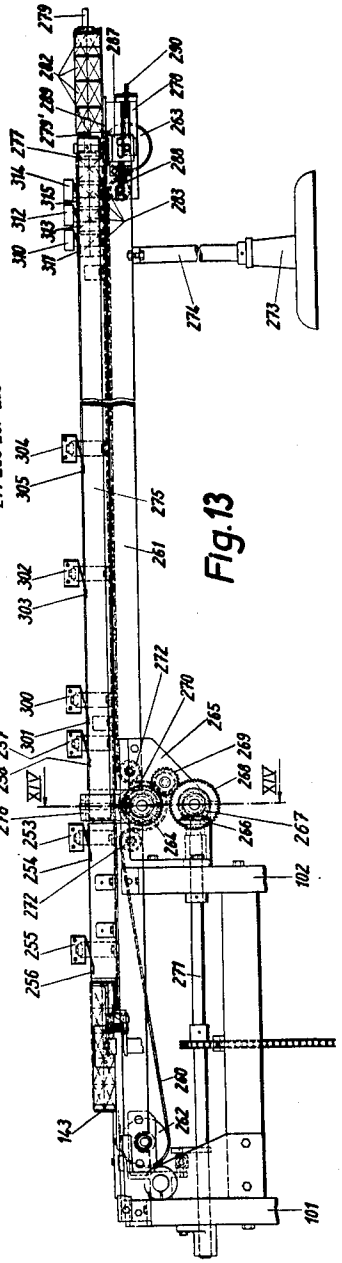


Fig. 13

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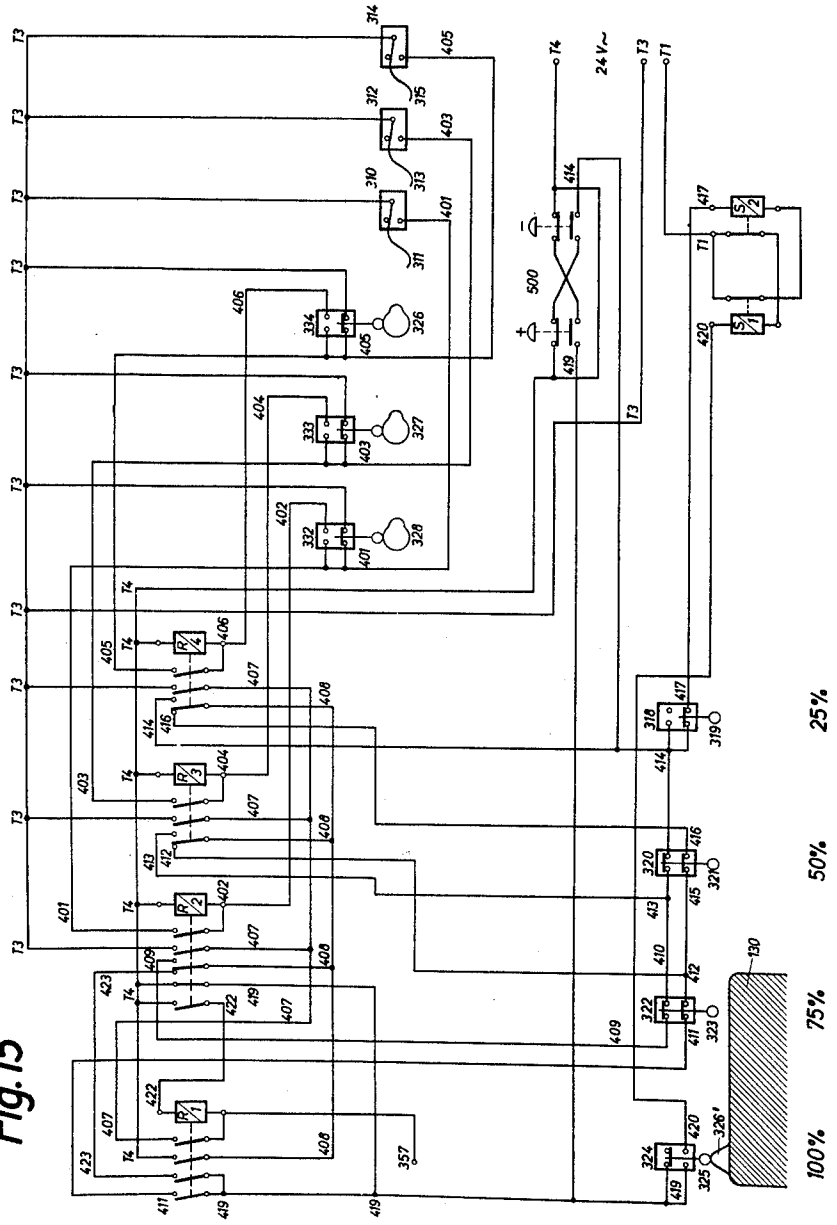


Fig.15

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PACKING MACHINES

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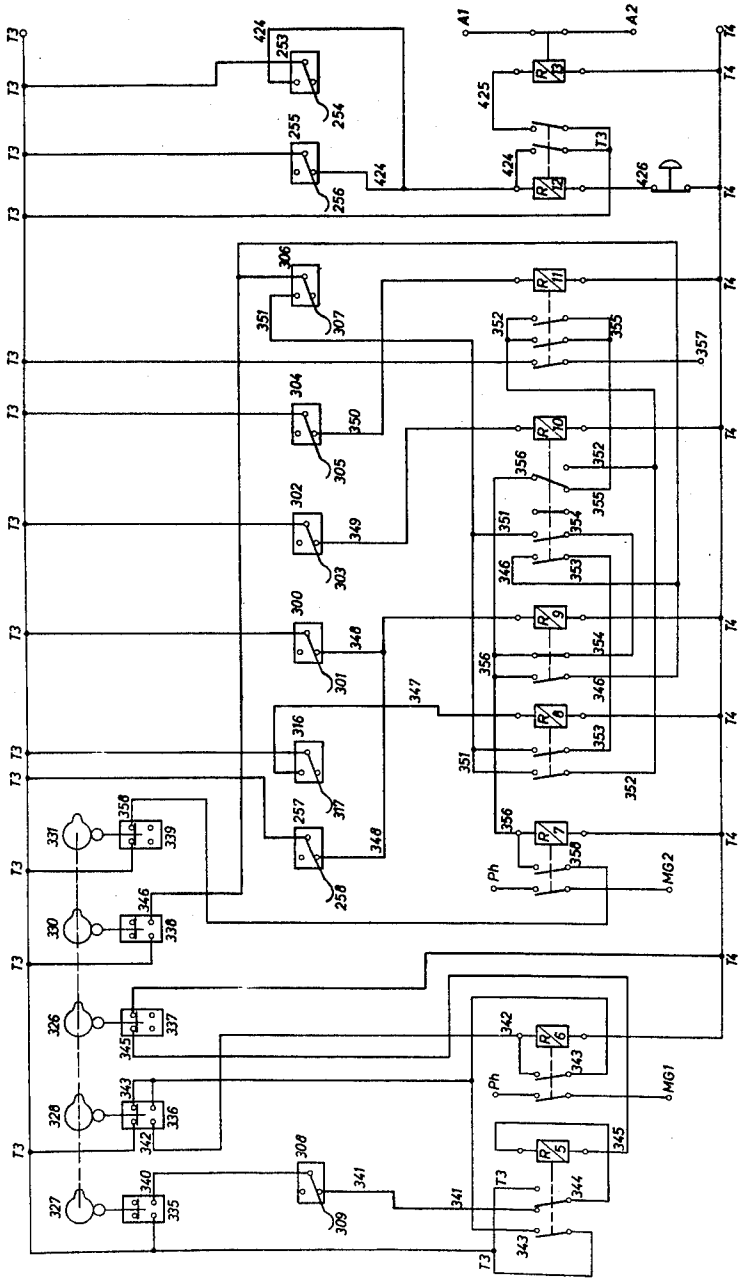


Fig. 16

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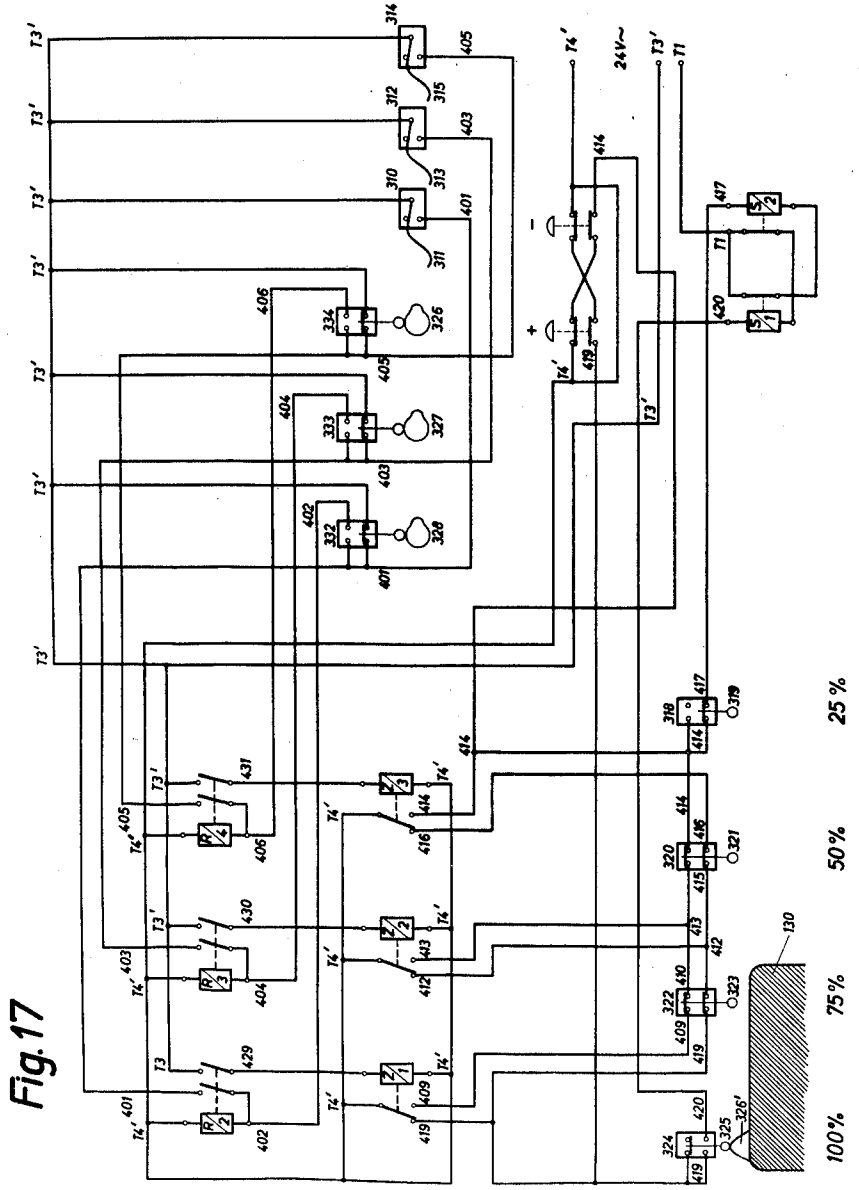


Fig. 17

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United States Patent Office 3,253,385 Patented May 31, 1966

3,253,385

PACKING MACHINES

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Filed Feb. 14, 1963, Ser. No. 258,407
6 Claims. (Cl. 53—55)

The invention relates to an arrangement for automatically controlling the operation of a machine for packing groups of a predetermined number of articles.

When packing groups of articles, the articles can in some cases not always be fed at a constant rate for packing, this being the case, for example, when the articles are packets of cigarettes and are fed from feeder conveyor channels each receiving the fluctuating output of individual cigarette packing machines.

Accordingly, it is an object of the invention to provide an arrangement for controlling a packing machine so that articles are not supplied to a packing station of the machine unless a number of articles sufficient to constitute the group is present.

It is a further object of the invention to ensure that for each group of articles a unit of packing material required for packing is available.

These and other objects and advantages of the invention will become apparent from the following detailed description of an embodiment of the invention when read in conjunction with the appended drawings which are given by way of example and in which:

FIG. 1 is a diagrammatic side view of a device for packing predetermined numbers of individual packets of articles, for example cigarettes, in cartons for such packets;

FIG. 2 is a diagrammatic side view, showing part of the device of FIG. 1, in a particular operational position thereof;

FIG. 3 is a diagrammatic side view, showing part of the device of FIG. 1, in another operational position thereof;

FIG. 4 is a perspective view of a turret member of the device of FIG. 1;

FIG. 5 is a perspective view of a carton blank such as is used by the packing device of FIG. 1;

FIGS. 6, 7 and 8 are perspective views illustrating various stages in the folding of the carton blank of FIG. 5, and the provision of cigarette packets therein to form a carton of cigarettes;

FIG. 9 is a side view, partly broken away and generally similar to FIG. 1, but showing various driving arrangements and auxiliary parts of the packing device;

FIG. 10 is an end view, partly broken away, the view being taken from the left hand end of the device as seen in FIG. 9;

FIG. 11 is a fragmentary view of a detail of the device, taken from the same aspect as FIG. 10, and showing parts of the device not clearly visible in FIG. 10;

FIG. 12 is a plan view of a conveyor device adapted for forming blocks of cigarette packets for feeding to the packing device of FIGS. 1 to 11;

FIG. 13 is a side view of the conveyor device of FIG. 12;

FIG. 14 is a sectional view taken along the line XIV—XIV of FIG. 13;

FIGS. 15 and 16 are circuit diagrams of an electric control arrangement associated with the packing device and conveyor device; and

FIG. 17 is a modified form of the circuit diagram of FIG. 15.

The packing device of FIGS. 1 to 11, the conveyor device of FIGS. 12 to 14 and the control arrangement of FIGS. 15 and 16 cooperate in the following manner:

Packets of cigarettes are fed onto a conveyor belt of the conveyor device from a feeder conveyor onto which the packets are fed from a plurality of cigarette packing machines. The presence of packets at various points on the conveyor belt is sensed by micro-switches of the control arrangement and, if the correct sensing signals are given, carton blanks are fed to a turret of the packing device, and a ram is subsequently operated to cause insertion of a group of packets from the conveyor belt into a carton blank which has already been partly shaped in the turret. The group of packets, for example ten packets of cigarettes arranged in two rows of five packets, will hereinafter be referred to as a block of packets.

Packing device

The packing device, the function of which is to pack predetermined numbers of packets of cigarettes, that is to say "blocks" of packets, in cartons, the cartons being formed from carton blanks taken from a magazine, will first be described in broad outline with reference to FIGS. 1 to 8.

The packing device illustrated comprises a four-cell turret member having a shaft **1**. The shaft **1** has a thickened part **2** of square cross section and the cells of the turret member are formed by four pairs of plates **3** and **4**, the plates **3** being supported on the flats of the square part **2** and the plates **4** being mounted by right-angular brackets **15** bolted to the plates **3**. Two pairs of ram bars **6**, are provided, one bar **6** being movable in each turret cell, the bars **6** of each pair being connected by two rods **7** guided in transverse bores in the square shaft part **2**, the rods **7** of one pair of bars **6** being at right angles to the rods **7** of the other pair of bars **6**, but lie in different planes.

The ends of the turret cells are substantially closed by brackets **5**, bolted to the plates **4** by bolts **17**. The brackets **5** have the function of folding over and holding carton flaps **26**, **27** (see FIGS. 4, 5 and 6). Above the turret, two pairs of pivotally mounted levers **13** are provided to which rails **11** and **12** are secured by screws **20**, the rails **11** and **12** serving for spreading carton flaps **21** and **22**.

At the sides of the turret, above one of the cells thereof when in a horizontal position, two levers **8** are provided which are interconnected by a rail **9**, a plate **10** being secured to the rail **9** by screws **19**. Below the lowermost cell a pair of carton supporting levers **14** is provided, together with a guide plate **53** for the carton, lateral plates **51** secured to the plate **53** and serving for folding carton flaps **28**, and a pair of plates **52** movable to and fro in the direction of the arrows shown thereon in FIG. 4, the plates **52** serving for indenting a folding line for the flaps **28**.

The packing device, so far described, operates as follows:

A carton blank shown in FIG. 5, has main body portions **23**, **24** and **25**, which are intended to be formed into a U-shaped formation, end flaps **26**, **27** and **28**, and body portion flaps **21** and **22**. The carton blank is fed above an uppermost cell of the turret, the turret being movable in intermittent steps of 90° each, into such a position that the portion **25** of the blank overlies the entrance to the uppermost cell. A ram **202** is then moved downwards, pressing the carton blank into the turret cell in such a manner that the body portions **23**,

24 and 25 of the blank take up the shape of a U in the cell. The levers 13 are mounted on an operating arm 203 of the ram 202, the levers 13 being movable away from each other, against the action of a spring 210, by the engagement of rollers 211 carried by the levers 13 against an abutment surface formed by an extension of a bearing 207 in which an operating rod 205 for the ram 202 is guided. The spreading of the rails 11 and 12 by the levers 13 is effected only after the carton blank has been given the U-shape form in the turret cell, the rails 11 and 12 bending the flaps 21 and 22 of the carton outwardly and thus weakening the fibrous resistance of these flaps in preparation for a subsequent inward folding operation. During the formation of the carton blank into the U-shape, the end flaps 26 and 27 are engaged by the brackets 5 and folded into the position shown in FIG. 6.

The ram 202 is then removed from the uppermost cell and the turret rotated by 90° so that the cell into which the carton blank was inserted, assumes a horizontal position, this position being shown in FIG. 2. A block of packets of cigarettes 29 is then inserted into the carton in the horizontal cell by a ram 179, and the levers 8 are operated to cause downward folding of the flap 21 by means of the folding plate 10. The turret is then rotated by a further 90° step, during which the flap 22 slides along a curved plate 180 and is thus inwardly folded so as to overlie the flap 21.

The cell in question has thus reached a vertical position, with its open end downwards, and the contents of the cell are prevented from falling out by the carton supporting levers 14. When a new blank is introduced into the uppermost cell by means of the ram 202, the uppermost ram bar 6, acting through the connecting rods 7, causes downward movement of the ram bar 6 which is arranged in the lowermost cell, this causing ejection of the carton of cigarettes from the said lowermost cell. During this ejection, the carton is supported by the levers 14 which yield until the carton is resting on the guide plate 53. Only the flaps 28 now remain to be folded, this being effected by the fixed lateral plates 51 while the carton is being moved along the guide plate 53 by means of a ram 198.

Packing device in detail

Referring now also to FIGS. 9 to 11, the packing device and the operation thereof will be described in greater detail.

The device has two side walls 101 and 102, which are connected together by transverse members 103, 104, 105 and 106. A driving motor 121 is provided on a setting plate 130, movably guided in rails 122 which are secured to the transverse member 103. A threaded spindle 123 is rotatably mounted in the transverse member 103 and engages a nut 124 which is secured to the setting plate 130.

Axial displacement of the spindle 123 is prevented by a stop collar 131 and a toothed wheel 125 secured to the spindle 123, the stop collar 131 and the toothed wheel 125 abutting against opposite sides of the transverse member 103 through which the spindle 123 extends. The toothed wheel 125 is driven by means of a toothed wheel 126 rotatable by a worm gear 129 arranged in a housing 127 of a setting motor 128. The motor 121 carries a cone pulley 132 which drives a cone pulley 133 by means of a V-belt 134, the pulleys 132 and 133 and the belt 134 constituting a known drive system of steplessly adjustable transmission ratio, variation of the transmission ratio being obtained by varying the position of the setting plate 130 by means of the setting motor 128 so as to vary the interaxial spacing between the pulleys 132 and 133. The variation in speed of the pulley 133 is required for enabling variation of the working rate of the packing machine.

The pulley 133 drives a shaft 135 on which it is mounted, the shaft 135 being supported in a bearing 149. The shaft 135 carries a pinion 136 which meshes with a toothed wheel 137 mounted on a shaft 108 which carries a pinion 138. The pinion 138 meshes with a toothed wheel 139 mounted on a shaft 109, and a pinion 140 carried by the shaft 109 meshes with a toothed wheel 145 mounted on a shaft 110, the toothed wheel 145 meshing with a toothed wheel 146 mounted on a shaft 111.

A chain wheel 147 provided on the shaft 111 drives a chain wheel 148 arranged on a shaft 115, by means of a chain 150, the shaft 115 serving as a drive shaft for an arrangement, which will subsequently be described, for drawing carton blanks from a magazine, feeding them to the region above the turret and applying glue to the flaps.

A chain wheel 151 provided on the shaft 110 drives a chain wheel 153 mounted on a shaft 154, by means of a chain 152. An actuating plate 155 is mounted on the shaft 154 and serves for driving a Maltese cross 157 mounted on a shaft 156. A toothed wheel 158 is connected to the shaft 156 and the Maltese cross 157 and meshes with a toothed wheel 159 mounted on the shaft 1 of the turret, thus providing a drive for the said turret.

A toothed wheel 160 provided on the shaft 115 serves for driving a toothed wheel 161 keyed to a shaft 113 which thus is driven. Toothed wheels 162, 163 and 164 (see also FIG. 11), mounted respectively on shafts 117, 118 and 119, are driven by two intermediate toothed wheels 165 and 166 (see FIG. 9) mounted on studs 167, the shafts 117, 118 and 119 thus being driven. The toothed wheel 161 also drives a toothed wheel 168 secured to a shaft 169. A toothed wheel 170 mounted on a shaft 114 meshes with a toothed wheel 171 secured to a shaft 172.

Lever mounting shafts 173, 174 and 175 are provided in the upper portion of the device and, in the lower portion of the device, lever mounting shafts 177 and 178 are provided.

The ram 179, which pushes the cigarette packets 29 into a partly folded carton blank when in the horizontal cell of the turret, is operated by a system of levers 181 and 186 and a pull rod 183 from cam disks 184 and 185 which are secured to the shaft 110. The lever 186 carries a square stud 188 with which a latch 187 cooperates, the latch 187 being mounted on the lever 181 by a pivot 192 and urged into engagement with the stud 188 by a tension spring 193. An adjustable abutment 223 having a setting screw 222 is provided on the lever 186 and abuts against the lever 181. The lever 186 is operated by the cam disks 184 and 185 and the lever 181 is only operated when the latch 187 engages the stud 188, which is normally the case. An electromagnet 190 is provided, however, and if by means of the electromagnet armature 191, the latch 187 is lifted from the stud 188, by engagement of the armature 191 with an extension 189 of the latch 187, the lever 181 is not operated by the cam disks 184 and 185. The electromagnet 190 is fixedly mounted on the transverse member 105 and a tension spring 194 is provided for normally holding the electromagnet armature 191, in its raised, inoperating position.

Levers 195 and 196 are provided on the lever mounting shaft 177, these levers being operable by other cam disks provided on the shaft 110. The lever 195 operates a connecting rod 197 for actuating the discharge ram 198, and the lever 196, through a connecting rod 199, actuates the carton supporting levers 14 which are secured to a lever mounting shaft 200 supported in a bearing member 201.

The ram 202 for inserting a carton blank into the uppermost turret cell is secured by the ram operating arm 203 to a beam 204 which is secured to the operating rod 205.

The operating rod 205 is slidably mounted in an upper bearing block 206 and a lower bearing block 207. The rod 205 is longitudinally reciprocatable by a connecting rod 208 which links the rod 205 to a lever 182 rockably mounted on the shaft 177 and engaging a cam disk arranged on the shaft 110.

The spreading levers 13 are rockably mounted on shafts 209 carried by the ram operating arm 203 and held in the un-spread position by the compression spring 210. In the lowermost position of the ram 202, when the carton blank has been pressed into the U-shaped form in the uppermost cell of the turret, the spreading rails 11 and 12 are moved apart by means of the levers 13, thus folding the flaps 21 and 22 of the carton blank outwardly, as shown in FIG. 3, and thereby facilitating their subsequent inward folding.

Supply of carton blanks

The carton blanks are contained in a magazine having side walls 213, a front wall 214, and a bottom 217. The front wall 214 is secured to a transverse supporting member 215 which is connected by a bracket 216 to fixed side wall portions 212 of the device. A suction arrangement 176 is swingably mounted in the wall portions 212 by means of a pivot 220, and is operable through a lever 224 and a connecting rod 225 by a lever 226 mounted on the shaft 175, the lever 226 engaging a cam disk on the shaft 113.

Sets of rollers 227, 228, 229, 230 and 232, 231, 233 are provided between the side wall portions 212. The rollers 228 are carried by levers 234 rockable about the shaft 118, the lever 234 being in engagement with a cam disk 235 mounted on the shaft 117. The roller 232 functions as a glue application roller having a segmental glue applying area. The roller 232 receives glue from a glue container 236 by means of a glue transferring roller 237 rotatable by the shaft 169. The glue container 236 is rockably mounted on a shaft 238 and the amount of glue transferred therefrom can be regulated by controlling the angular position of the glue container 236 by means of an eccentric 239.

A further glue application arrangement is provided on a transverse frame member 240. In this, a glue transferring roller 241 is mounted on the shaft 172. A glue container 242 is rockably mounted about a shaft 244 and can be adjusted in position relative to the glue transferring roller 241 by means of an eccentric 243. The bearings for the shaft 244 and for the eccentric 243 are provided on a displaceable plate 246, and this plate is provided on a further displaceable plate 245, so that the glue application arrangement forms a movable unit. The shaft 174 is mounted on the plate 245 and carries levers 247 which serve to press the flap 21 of the carton against the glue transferring roller 241 and thus effect the application of glue to the flap 21. The levers 247 are actuated by a lever 248 and a connecting rod 249 from a lever 250 which is rockably mounted on the shaft 178 and has an arm 251 engaging a cam disk 252 provided on the shaft 111.

Conveyor device

A conveyor belt 260 forming part of the conveyor device of FIGS. 12, 13 and 14 is provided which is movable in a direction transverse to the direction of movement of the ram 179, for conveying blocks of cigarette packets 29 above a flat portion of the plate 180 from which the blocks can be introduced into the turret by means of the ram 179. The packets collect against an abutment 143 at one end of the conveyor belt 260. The conveyor belt 260 is entrained on rollers 262 and 263 which are rotatably mounted in a frame 261. The roller 263 is radially displaceable in order to enable tensioning of the belt 260. A further belt entraining roller 264 (see FIGS. 12, 13 and 14) is mounted in a bearing plate 265 and is driven by a chain of toothed wheels 268, 269 and 270 from a shaft 271' carrying a bevel wheel 267, the bevel wheel 267 being driven by a bevel wheel 266 mounted on a drive shaft 271. Two idler rollers 272 are provided for increasing the angular contact area between the belt 260 and the belt driving roller 264. The frame 261 is supported near its end having the roller 263, by a column 274 and a supporting base 273.

At the sides of the conveyor belt 260, endless belts 275 movable in vertical planes are provided, each of these belts 275 being guided by a pair of rollers 276, 277. The rollers 276 of each pair are mounted in the bearing plate 265 and the other roller 277 of each pair is mounted on a bracket 287 which is adjustable in position relative to the frame 261 by means of an adjusting screw 288. Adjusting screws 290 are provided for tensioning the belt 260, the screws acting on the bearings of the conveyor guide roller 263.

At the end of the frame 261 having the guide roller 263, a feed platform 289 is provided for receiving individual packets of cigarettes for feeding onto the conveyor belt 260 by means of a reciprocatably movable ram 279.

The side wall 102 carries a control valve 291 (see FIG. 12), operable by means of an electromagnet 292, the valve serving for controlling the application of suction to the suction arrangement 176 shown in FIGS. 9 and 10. The valve 291 is connected to a vacuum line by a connection 293, and to the suction arrangement 176 by a connection 294.

Detailed operation of packing device and conveyor device

The packing device and conveyor device operates as follows:

The lowermost carton blank (having the form shown in FIG. 5) in the magazine 213, 214, 217 is held at its leading end by the suction arms 221 of the suction arrangement 176, and the suction arrangement 176 is rocked about the pivot 220 to such an extent that the leading end of the carton blank is applied to the rollers 227. The rollers 228, which at this stage are spaced apart from the rollers 227, are swung against the rollers 227 and, since both the rollers 227 and 228 are driven, the gripped carton blank is drawn out of the magazine. The blank then passes through the rollers 229 and 230; and 231, 232 and 233, onto a platform 295, into the position shown in FIG. 1.

The ram 202 is then moved downwards and the blank is thereby pushed into the uppermost cell of the turret, in a U-shaped form, downwardly bent lug portions 295' of the platform 295 assisting in the initial establishment of the U-shaped form. While the carton blank is being pushed into the turret cell, the end flaps 26 and 27 of the blank are folded into the position shown in FIG. 6 by engagement with the brackets 5.

When the ram 202 approaches its end position of movement, the rollers 211 engage against the lower bearing block 207 and thus cause outward movement of the levers 13 and of the spreading rails 11 and 12, with the result that the flaps 21 and 22 of the blank are bent outwardly, in a direction opposite to their subsequent closure direction, into the position shown in FIGS. 4 and 6.

The ram 202 is then moved back into its initial position, shown in FIGS. 1 and 2, and after rotation of the turret by 90° in a clockwise direction as viewed in FIGS. 1, 2, 3 and 9, that is to say into the position shown in FIG. 2, the ram 179 is operated to cause movement of a collected block of packets of cigarettes from the position F on the conveyor belt 260, into the horizontally lying cell of the turret, which now contains a carton blank in U-shaped form, the block of packets thus being inserted into the shaped carton.

The levers 8 are then operated, and the plate 10 engages the carton flap 21 as shown in FIGS. 1 and 3, and folds the flap 21 inwardly into the position shown in FIG. 7.

During the transport of the carton blank from the magazine, the flaps 28 thereof have already had glue ap-

plied thereto by means of the glue transfer roller **237** and the segment roller **232**, and the flaps **21** have had glue applied thereto by means of the glue transferring roller **241**, controlled by the lever **247**. The amount of glue applied is such as will hold the flaps securely closed, but nevertheless readily allow intentional separation of the glued flaps when opening the carton. Now on rotation of the turret by one more step of 90°, the flap **22** slides along the curved plate **180** and is folded thereby into an overlying position with relation to the flap **21** and thus adheres thereto. At this stage the turret cell having the carton therein is the lowermost cell of the turret, and the ram **202** is again operated to introduce a fresh carton blank into the cell of the turret which is now uppermost, a blank having already been conveyed to the platform **295** for this purpose in the same manner as described above. When now the ram **202** is operated, it engages the ram bar **6** in the said uppermost cell and thus, by means of the rods **7**, causes the ram bar **6** in the lowermost cell to eject the carton of cigarettes therefrom. The ejected carton is supported by the levers **14** which move downwardly from the position shown in FIG. 9 into the position shown in FIG. 4, the levers **14** holding the flap **22** closed against the flap **21** until the carton reaches the guide plate **53** (FIGS. 4 and 9). The ram **198** is then operated to push the ejected carton further along the guide plate **53**, the carton pushing before it cartons which have previously been ejected from the turret, the cartons being then taken from the guide plate **53** by hand or by known mechanical removal means (not shown).

The lateral plates **51** at the sides of the guide plate **53** in the region thereof which is in the vicinity of the turret, engage the glued flaps **28** of the carton blank, while the ejected carton is being pushed along the guide plate **53** by the ram **179**, the indenting plates **52** having first been moved into engagement with the flaps **28** to indent folding lines therein, and on movement of the carton, the flaps **28** are folded over into glued engagement with the already folded end flaps **26** and **27**.

Now, as will be seen from FIG. 12, the conveyor arrangement is supplied with packets of cigarettes in the direction of the arrow shown at the right hand side of FIG. 12, for conveying to the packing device. This supply of packets is effected by a conveyor belt **281** and, as shown, four columns of packets, each column stacked two packets high, are carried by the belt **281**, each column representing the output from one cigarette packing machine, that is to say a machine packing a plurality of cigarettes into an individual packet. Of course, any number of cigarette packing machines may be used, the conveyor belt **281** being of a width appropriate to the number of machines used.

Since the output rate of cigarette packing machines is not constant, it is desirable to provide means for regulating the working rate of the packing device already described, that is to say the device for packing packets of cigarettes into cartons. This regulation is effected by means of the continuously variable transmission between the driving motor **121** (see FIG. 9) and the turret, which comprises the pulleys **132** and **133** and the V-belt **134**, and which is controlled from the setting motor **128** by means of the elements **125**, **126**, **127**, **123**, **124**, **131** and **130**. At the same time the vacuum control valve **291** is controlled by means of the electromagnet **292** and operation of the locking electromagnet **190** for the ram **179** is controlled.

Relationship of control arrangement to packing and conveyor devices

For controlling the above mentioned regulation three microswitches **300**, **302** and **304** are arranged above the conveyor belt **260**, the micro-switches respectively having operating feelers **301**, **303** and **305** which extend into the path of movement of packets on the conveyor belt **260** to such an extent as to cause operation of the respective micro-switch when a cigarette packet engages one of the feelers in passing under the same.

Referring now to FIGS. 12 and 13, it will be seen that the ram **279**, which is operated in timed relation to the stepwise rotation of the turret of the packing device, pushes the endmost row **282** of packets from the conveyor belt **281** onto the conveyor belt **260** which runs transversely thereto, the block of eight packets (four packets wide and two packets high) assuming a position **283** on the conveyor belt **260**. Since the ram **279** always moves into the same end position with respect to the conveyor belt **260** when pushing packets thereonto, the number of groups of two packets present at the position **283** at the instant when the ram **279** is in the position **279'** shown in FIG. 13, is a measure of the operating rate of the packing machines supplying the conveyor belt **281** and of the packing rate at which the packing device having the turret must operate. These groups of two packets will hereinafter be referred to simply as packets.

At the position **283**, three micro-switches **310**, **312** and **314** are provided, that is to say one less than the number of packing machines supplying the conveyor belt **281**. The micro-switches respectively have feelers **311**, **313** and **315**, arranged for operating the respective switches when engaged by packets in the position **283**. The first micro-switch **310** is arranged above the position of the first packet at the position **283**, the second micro-switch **312** above the position of the second packet and the third micro-switch **314** above the position of the third packet. The position of the fourth packet, that is to say the position immediately adjacent to the ram **179** when in the position **179'** has no micro-switch, since if a packet is missing from any one of the columns of the conveyor **281**, a packet will in any case be present in the normal position of the fourth packet, so long as at least one of the columns of the conveyor **281** has a packet for engagement by the ram **279**. If the three micro-switches **310**, **311**, **314** are operated by their respective feelers, then four packets are present at the position **283**; if two of the micro-switches are operated, then one packet is missing, if only one of the micro-switches is operated, then two packets are missing and if none of the micro-switches is operated then three packets are missing from the position **283**.

As will be described below, the rate of working of the packing device having the turret, is controlled in dependence on the number of packets present at the position **283** on the conveyor belt **260**. In exceptional circumstances it may occur that none of the columns of the conveyor belt **281** contains a packet for delivery to the position **283**. In such a case, however, the packing device is not brought to rest as the danger would exist of the glue drying on the glue transferring rollers. The absence of all four packets from the position **283** is, however, very exceptional.

As explained above, the three micro-switches **310**, **312** and **314** determine the working rate of the packing device. If only three packets are sensed at the position **283**, the working rate of the packing device must be reduced to 75% of normal and if only two packets are sensed at the position **283**, the working rate of the packing device must be reduced to 50% of normal, this being effected by control of the continuously variable transmission **132**, **133** and **134**, by displacement of the setting plate **130** (see FIG. 9) by means of the setting motor **128**. The setting plate **130** has four predetermined positions corresponding to full speed, three quarter speed, half speed, and one quarter speed, of the drive transmitted by the continuously variable transmission, and these positions of the setting plate **130** are respectively positions in which a projection **326'** on the setting plate actuate limit switches **324**, **322**, **320** and **318**, having

feelers **325**, **323**, **321** and **319** engageable by the said projection **326'**.

The electrical circuit of the entire control arrangement is shown in FIGS. 15 and 16. As will be seen from the subsequent description of the control arrangement, when one or more of the micro-switches **310**, **312** or **314** is operated, the setting motor **128** is operated until the projection **326'** on the setting plate **130** has operated the limit switch **324**, **322**, **320** or **318** corresponding to the required percentage of normal operating speed of the packing device.

In order that the packing device can continue to run if no packets are fed, and in order to ensure that idling of the packing device and re-commencement of operation thereof is effected in a satisfactory manner in such a case, the three micro-switches **300**, **302** and **304** are provided, these being arranged above the conveyor belt **260** in predetermined positions. It has been found desirable to have present on the conveyor belt **260** at any given time, twice the number of packets as are required for one carton. Accordingly, at a distance spaced from the abutment **143** at the left hand end of the conveyor belt **260**, as viewed in FIGS. 12 and 13, by an amount equal to the total width of eight packets, the micro-switch **300** is provided. Thus if less than eight packets are present in close succession on the conveyor belt **260**, counting from the left hand end thereof, the feeler **301** of the micro-switch **300** drops and, as will be later described with reference to FIG. 16, the electromagnet **190** is energized and the ram **179** thus prevented from operating, so that no packets are pushed into the turret and the turret thus runs idle. This condition is prepared for by the micro-switch **304** which is spaced back along the conveyor belt **260** from the micro-switch **300** by twice the length of the block of packets which corresponds to one carton. The reason for this is that in normal operation of the packing device there are always two carton blanks en route to the station where packets are inserted into the turret, and in order to prevent blockages, these two carton blanks must in all cases be used. The micro-switch **304** is thus spaced so far from the delivery end of the conveyor belt **260** that at any time at least as many packets have passed under it, but have not yet been engaged by the ram **179**, as are required for two cartons. If after the feeler **305** of the micro-switch **304** has dropped, no further packets are fed by the conveyor belt **260** past the micro-switch **304**, then subsequently the feeler **303** of the micro-switch **302** will drop and then the feeler **301** of the micro-switch **300**.

Now, if reference is made to FIGS. 1 and 9, there will be seen three micro-switches **306**, **308** and **316**, respectively having feelers **307**, **309** and **317** arranged in the feed path of the carton blanks to the turret. These microswitches are for enabling the feed of carton blanks to be re-established when packets are again being fed to the packing device after an interruption. Only when the condition of the micro-switches **306**, **307** and **308** is such as corresponds to the absence of a carton blank from the feed path between the carton blank magazine and the turret, can the feeding of a fresh carton blank be established, one carton blank being fed for each block of packets fed along the conveyor **260**, the micro-switch **304** serving for controlling the application of vacuum to the suction arms **221**.

Idling of the packing device takes place as follows: The feeler **305** of the microswitch **304** drops, at which stage two carton blanks and two blocks of packets are still on the way to the packing position. Now, the blocks of packets are fed to the packing device with a periodic rhythm, whereas the carton blanks are fed to the micro-switch **308** at a constant speed. For the sake of safety, the control of the feed of carton blanks is divided between two micro-switches, that is to say the micro-switch **308** and the micro-switch **306**, which are so spaced that if the feeler **304** of the micro-switch **305**, arranged above

the conveyor belt **260**, drops, then the carton blank being fed is either in engagement with the micro-switch **306** or **308** and the vacuum connection to the suction arms **221** is interrupted by operation of the electromagnet **292**. Again, if the feelers **302** and **304** of the micro-switches **303** and **305** have fallen, then the carton being fed is either in engagement with the micro-switch **306** or **308** and the vacuum connection to the suction arms **221** is again interrupted. If the feelers **301**, **303** and **305** of the three micro-switches **300**, **302** and **304** have fallen, then the vacuum connection to the suction arms **221** remains permanently interrupted.

As soon as the feeler **301** is lifted by the passage thereunder of a packet, then a carton blank is not in engagement with the micro-switches **306** and **308** and the vacuum connection to the suction arms **221** is established by de-energization of the electromagnet **292** which controls the valve **291**. It will be appreciated that the vacuum connection to the suction arms **221** is controlled both in dependence on the presence of packets on the conveyor belt **260** and in dependence on the presence of carton blanks in the feed path therefor.

The variation in the working speed of the packing device, which is effected in dependence on the condition of the micro-switches **310**, **312** and **314**, only becomes effective when the feeler **305** of the micro-switch **304** has dropped. It is thereby prevented that the control of the working speed of the packing device is initiated on the occurrence of small fluctuations in the supply of packets for packing, but it is nevertheless ensured that idling of the machine is initiated without fail, when required.

The vacuum control valve **291** must be operated to interrupt the vacuum connection to the suction arms **221** when the said arms **221** are in a definite neutral position and the latch **187** must be operated to secure the ram **179** when the ram is in its withdrawn end position. For allowing such timed operation, switching cams **326**, **327** and **328** are provided, which are driven in timed relation to the variable speed drive of the packing device and ensure that the switching of the electromagnets **292** and **190** is effected at the appropriate time during the movement of the suction arms **221** and the ram **179**. The switching cams **326**, **327** and **328** are provided on an extension of the shaft **151** (see FIG. 10, left hand side) and cooperate with switches **334**, **333** and **332** respectively, arranged on a bracket **280** secured to the side wall **101**.

Referring now in greater detail to FIG. 15, there will be seen at the right hand side three terminals leading respectively to wires T1, T3 and T4. The steplessly variable transmission used in the packing device is of such a kind that can only be varied in ratio during running. Thus, relay windings S1 and S2 shown in FIG. 15, and which are provided for switching the setting motor **128** (FIG. 9) for forward or backward running respectively, are so arranged as to receive operating voltage only after a relay (not shown) controlling the main driving motor **121** (see FIG. 9) has been energized, the operating voltage for the relay winding S1 or S2 being received from the wire T1. The analogous wire, which receives voltage regardless of the condition of the relay controlling the main driving motor **121**, is T3. Between wire T1 or T3 and wire T4, a voltage of 24 volts is applied, this serving as a control voltage for operation of the various relays, electromagnets and lamps in the arrangement.

Four relays are shown in FIG. 15. Relay R1 is operated when it is required for the packing device to operate at 75% of its normal working speed, relay R3 is operated when the packing device is required to operate at 50% of its normal speed, and relay R4 for 25% of normal speed, the relays thus corresponding with the respective micro-switches **322**, **320** and **318**. R2 is a control relay which is operated by the micro-switch **310** and is arranged for preparing a circuit which is effective only when relay R1 is energized by dropping of the feeler **305**

of the micro-switch **304**. Only when relay **R2** has prepared the circuit does relay **R1** respond, effecting regulation of the working speed to 75% of its normal full speed. Thereafter, for further regulation down to 50% and 25% of normal full speed, the feeler **305** of the micro-switch **304** will, of course, remain in its unsupported condition.

The circuit of FIG. 15 will now be described with reference to the various degrees of regulation possible.

For regulation of the working speed of the packing device to 75% of the normal full working speed, an initial requirement is that the feeler **311** of the micro-switch **310** drops. Thus, a contact leading to wire **401** of the micro-switch **301** is connected to the wire **T3**. A contact leading to wire **401** of the micro-switch **301** is also connected to a contact leading to wire **401** of the switch **332** which is a single pole two-way switch. When not operated by the cam **328**, the contact of the switch **332**, which leads to wires **401** and **T3**, are bridged and the contact of said switch, which leads to wire **402** and is connected thereby to a contact of relay **R2**, is open. Consequently, until the cam **328** operates the switch **332**, the dropping of the feeler **311** has no effect. If a packet is in its normal position underneath the micro-switch **310** then the contact leading to the wire **401** of the switch **332** is not connected to wire **T3** by the switch **310** and thus when the lobe of the cam **328** operates the switch **332** to connect the contact leading to the wire **401** thereof to the contact leading to the wire **402** no connection is made between the contact leading to the wire **401** of the switch **332** and the wire **T3**. If, however, a packet is not present underneath the micro-switch **310**, then the contact leading to the wire **401** of the switch **332** is connected to the wire **T3** and on operation of the switch **332** the contact leading to the wire **402** thereof is connected to the wire **T3** so that thus the relay **R2**, one terminal of which is permanently connected to the wire **T4**, is energized for the duration of the operation of the switch **332**, that is to say for about one eighteenth of the time of one revolution of the cam **328**. Relay **R2** has a self-holding contact which connects wire **402** to wire **401** and thus when the switch **332** is changed over by the cam **328** moving out of range, the relay **R2** does not lapse. Relay **R2** can only lapse if the feeler **311** of the micro-switch **310** is engaged by a cigarette packet at the same time that the switch **332** is changed over by movement of the cam **328** into range. In any case, if the feeler **311** has dropped, **R2** remains energized, but initially has only the function of preparing a circuit between the wire **T4** and the wire **422** leading to the relay **R1**.

Relay **R1** is energized by the connection of wire **357** to the wire **T3** by a relay **R11** (see FIG. 16) which is connected across the wires **T3** and **T4** in series with the micro-switch **304**. By means of contacts leading to wires **409** and **408** of relay **R2** and contacts leading to wires **408** and **T4** of relay **R1**, a current circuit for the relay winding **S2** is established and the setting motor **128** is thus caused to rotate in a direction such as to move the projection **326'** of the setting plate **130** towards the sensing roller **323** of the limit switch **322**. As soon as the projection **326'** has displaced the sensing roller **323** of the limit switch **322**, the connection between contacts leading to wires **411** and **412** of the limit switch **322** is interrupted and the relay winding **S2** is de-energized, the 75% position having been reached.

If the deficiency in supply of packets is overcome and packets are again supplied to the conveyor belt **260** in the full amount, then both feeler **311** and feeler **305** are lifted by the passage of packets thereunder. Thus relay **R1** lapses and also relays **R2** and **R11**. The relay winding **S1** is at this stage connected to wires **T1** and **T4** through the contacts leading to wires **419** and **420** of the limit switch **324**, and contacts leading to wires **419** and **T4** of relay **R2**. Consequently the setting motor **128** is operated in the forward direction, moving the setting plate **130** towards the left as viewed in FIG. 9, until the projection **326'** on the setting plate **130** engages the sensing roller **325** of the limit switch **324** and thus interrupts the connection between the contacts leading to wires **420** and **419** thereof. The 100% position has thus been reached.

In considering regulation to 50% of full normal working speed, it will be assumed that regulation has first been effected to the 75% position, although if regulating direct from the 100% position to the 50% position the 75% position would in any case be passed through without however a pause being made at the 75% position.

The requirement for regulation to the 50% position is the dropping of the feeler **313** of the micro-switch **312**. Of course, in such a case the feeler **311** also drops or has in fact already dropped, as also the feeler **305** of the micro-switch **304**. The rotating cam **327** thereafter lifts the contact bridge of the switch **333**, which is a single pole two way switch, and causes closure of contacts leading to wires **403** and **404** thereof. Relay **R3** is thus energized and remains held by its self-holding contacts leading to wires **403**, **404**, as long as the feeler **313** is not lifted by passage of a packet thereunder. If the feeler **313** is lifted, then the connection of contacts leading to wires **403** and **T3** by the switch **333** maintains the circuit to the relay **R3**. Since the connection between the contacts leading to wires **403** and **T3** of the switch **333** is interrupted by passage of the cam **327** out of range, **R3** would then lapse at a predetermined instant. If however, the feeler **313** remains in the dropped condition and the relay **R3** thus remains energized, the relay winding **S2** is energized through the closed contacts leading to wires **408** and **413** of the relay **R3** by the potential between lines **T1** and **T4**. The setting motor **128** thus rotates in the backward direction until the projection **326'** of the setting plate **130** engages the sensing roller **321** of the switch **320** and thus causes interruption of the connection between contacts leading to wires **413** and **414** thereof. The setting plate **130** then remains in this position, which is the desired 50% regulation position.

Return regulation to the 75% position is effected when the feeler **313** is lifted and relay **R3** lapses, the circuit to the relay winding **S2** then being established from contacts leading to wires **408** and **412** of relay **R3**, contacts leading to wires **411** and **412** of switch **322**, contacts **419** and **411** of relay **R1**, contacts **419** and **420** of switch **324**. When regulating back to the higher percentage, the relays **R1** and **R2** remain energized until the 100% position is reached, this requiring that the feeler **311** is lifted by the presence of a packet thereunder.

For regulation of the working speed of the packing device down to 25% of its normal full working speed to be required, the feeler **315** will have dropped, so that now all of the feelers **311**, **313** and **315** will be in the dropped condition. The relay **R4** is energized through the connection of contacts leading to wires **405** and **T3** of the micro-switch **314**, as soon as the cam **326** has caused the bridge of the switch **334** to form a connection between contacts leading to wires **405** and **406** of the switch **334**. The relay **R4** is additionally held through self-holding contacts leading to wires **405** and **406** thereof as soon as the cam **326** moves out of range of the switch **334** and allows the bridge of the switch to connect contacts leading to wires **405** and **T3** thereof, the procedure being the same as described for relay **R3**. The relay winding **S2** is then energized through a current circuit extending from terminals leading to wires **T1** and **T4** through contacts leading to wires **417** and **414** of switch **318**, and contacts leading to wires **414** and **408** of relay **R4**. Thus the setting motor **128** is operated and displaces the setting plate **130** to such a position that the projection **326'** thereof engages the sensing roller **319** of the limit switch **318** and interrupts the connection therein between contacts leading to wires **414** and **417**. The current circuit of the relay winding **S2** is thus interrupted and the setting plate **130** remains in the 25% regulation position.

Regulation back to a faster working rate for the packing device is initiated when the feeler **315** is lifted by the presence of a packet thereunder. The connection between contacts leading to wires **405** and **T3** thereof is then interrupted and the relay **R4** lapses. The relay winding **S1** is then energized through a current circuit extending from contacts leading to wires **420** and **419** of the limit switch **324**, contacts leading to wires **411** and **419** of relay **R1**, contacts leading to wires **411** and **412** of limit switch **322**, contacts leading to wires **415** and **416** of switch **320** and contacts **416** and **408** of relay **R4**. The setting motor **128** is thus operated in the forward direction until the projection **326'** on the setting plate **130** engages the sensing roller **321** of the switch **320** and interrupts the connection between the contacts leading to wires **415** and **416** thereof, thus stopping the setting motor at the 50% position. Further regulation back to the 75% and 100% positions is effected as already described.

A switch **500** is provided in the wire **T4** of FIG. 15. This switch enables an overriding manual control of the working speed of the packing device to be exercised. If the packing device is running at normal full speed, and the button — of the switch **500** is depressed, the relay winding **S2** is energized and the setting motor **128** thus operated for displacing the setting plate **130** towards the right as viewed in FIG. 15. As soon as the button — is released, the setting motor **128** returns the setting plate **130** to the 100% position, or to whatever position is dictated by the automatic control procedure taking place. A similar action takes place when the button + of the switch **500** is pressed. Moreover, the switch **500** enables an entirely manual control of the working speed of the packing device to be effected, if the automatic control apparatus is out of operation.

At the left hand side of FIG. 10, five cams **326**, **327**, **328**, **330** and **331** are shown. The cams **326**, **327** and **328** are the same as those referred to above in connection with FIG. 15, and cooperate with the switches **334**, **333** and **332** respectively. The cams **326**, **327** and **328** also cooperate with other switches **337**, **336** and **335** shown in FIGS. 10 and 16. Moreover, the cams **330** and **331** cooperate with switches **338** and **339** as shown in FIGS. 10 and 16.

Now, in the circuit diagram of FIG. 16 there will be seen a relay **R6** having a contact set which on energization of the relay **R6**, forms a connection between a current source *Ph* and a terminal **MG1** connected to the electromagnet **190** which controls latching of the ram **179**. When the packing device is first started up it must run idle for one working cycle, as otherwise the ram **179** would introduce packets into the turret before the correct insertion of a carton blank into the turret has been effected, this being because the relay **R6** has not been energized for initiating latching of the ram **179**. Thus the micro-switch **308** is arranged as shown in FIG. 16, so that if a carton blank has not operated the micro-switch **308**, then when the switch **335** is actuated by the cam **327** to form a connection between wire **T3** and the contact leading to the wire **340**, the micro-switch **308** forms a connection between the contact leading to the wire **340** and its contact leading to the wire **341**, causing relay **R5** to be energized, the relay **R5** being self-holding through the connection **T3–344**. At the same time the relay **R5** forms the connection **T3–343** and subsequently, by means of the cam **328** the connection **343–342** is formed by the switch **336** and the relay **R6** is thus energized. Since the connection **T3–343** is maintained by the relay **R5**, relay **R6** remains energized when the cam **328** moves out of range of the switch **336**.

Relay **R6** initiates latching of the ram **176** and thereafter the relay **R5** is released by the cam **326** actuating the switch **337** and thus interrupting the connection **T4–345** formed thereby. Relay **R6** remains held until the cam **328** again actuates the switch **336** and thus interrupts the connection **T3–343** formed thereby. It will therefore be appreciated that in no case are packets pushed by the ram **179** into the turret during an operating cycle in which the micro-switch **308** is not actuated by a carton blank.

Now if a carton blank has not actuated the micro-switches **306** and **316**, and if packets are not present beneath the micro-switches **300**, **302** and **304**, on the conveyor belt **260**, then it is required that the feed of carton blanks from the carton blank magazine be interrupted. The micro-switch **338** shown in FIG. 16 serves for controlling interruption of the vacuum connection to the suction arms **221** (see FIG. 9), and is operated at the appropriate time in the operating cycle of the packing device, by the cam **330**. When operated, the switch **338** forms the connection **T3–346** and since relay **R9** has already been energized by the micro-switch **300** the connection **346–356** formed thereby completes the energizing circuit to relay **R7**. When relay **R7** is energized, a connection is formed thereby between a current source *Ph* and a terminal **MG2** connected to the electromagnet **292** (see FIG. 12) which operates the valve **291** and interrupts the vacuum connection to the suction arms **221**.

If during the operative time of the cam **330**, a packet happens to be beneath the micro-switch **300**, the relay **R7** would lapse and the vacuum to the suction arms **221** would be re-established. In such a case, if further packets were not present subsequent to the packet beneath the micro-switch **300**, the conveyor belt **260** would run empty. In order to prevent this, a micro-switch **257** having a feeler **258** is provided above the conveyor belt **260** at a region spaced by one and a half times the length of a packet from the micro-switch **300**, in the direction towards the abutment **143**. As can be seen from FIG. 15 the micro-switch **257** is connected in parallel with the micro-switch **300**.

When packets are fed to the conveyor belt **260** it may happen that a packet assumes an end-on position rather than lying parallel to the conveyor belt **260**. In order to stop the machine in such a case, a micro-switch **253** having a feeler **254** is arranged over the conveyor belt **260** at a region between the micro-switch **257** and the ram **179**. As can be seen from FIG. 16, the micro-switch **253** closes a connection **T3–424** to a relay **R12** for energizing the same, when the feeler **254** of the micro-switch **253** is lifted to its maximum extent, as would occur on the presence of an end-on packet thereunder. The relay **R12** is connected by a connection **426** and a manually operable interrupting switch, to **T3** and has a normally open self-holding contact set and also a normally open contact set which when closed connects a relay **R13** between **T3** and **T4** by a connection **425**. The relay **R13** has a normally closed contact set bridging terminals **A1** and **A2** which are connected in series with a power supply to the machine. Consequently on lifting of the feeler **254** of the micro-switch **253** to a sufficient extent, relay **R12** is energized, this causing relay **R13** to be energized and thus the power supply to the machine interrupted. When it is desired to restore the power supply to the machine, the interrupting switch in series with connection **426** is opened, thus allowing the relay **R12** to lapse, with consequent opening of the self-holding contact set thereof.

In order to prevent the packets of the block F of FIG. 12 from being acted on by the ram **179** if no packets immediately prior to the packets shown in FIG. 12 are present on the conveyor belt **260**, a micro-switch **255** having a feeler **256** is arranged above the conveyor belt **260** in a position for sensing the presence of a packet immediately prior to the packets which are acted on as a block by the ram **179**. As can be seen from FIG. 16, the micro-switch **255** is connected in parallel with the micro-switch **253** and, when the feeler **256** falls, the relay **R13** is energized and the machine stopped.

If, after an interruption in the feed of packets to the conveyor **260**, packets are again fed for packing, and operate the micro-switch **300**, the connection **T3–348** is

opened thereby and relay R9 lapses, the connection 356–346 being interrupted thereby and a connection 356–354 formed. Relay R7 then lapses after approximately 300° rotation of the cam 331, when the lobe thereof actuates the switch 339 and thereby interrupts a connecton T3–358 normally formed by the switch 339. On lapsing of the relay R7 at this predetermined time instant, the electromagnet 292 is de-energized and the vacuum connection restored to the suction arms 221. The carton blank then engaged by the suction arms 221 actuates the micro-switch 306 which thereby forms a connection 346–351. Since, however, only the micro-switch 301 at the conveyor belt 260 has been actuated, relay R9 remains unenergized. The carton blank then passes to the micro-switch 316 and causes the connection T3–347 to be formed thereby, so that relay R8 is energized and forms the connections 351–352 and 351–353. Now at this stage no packets are present on the conveyor belt 260 and therefore relay R10 is in the energized condition, due to the micro-switch 302. The same applies to relay R11. Thus by relay R10 the connections 346–353, 351–354 and 356–352, are formed and by relay R11 the connections 352–355 and T3–357. Due to the connection 351–353 formed by relay R8, the connection 351–354 formed by relay R10 and the connection 354–356 formed by relay R9, relay R7 is energized and forms the connection P*h*–MG2 for the electromagnet 292 of the vacuum valve 291, so that no further carton blanks are fed from the magazine.

The control of the vacuum valve 291 is thus effected in such a manner that the following four operational cases arise:

(1) If a carton blank is not in engagement with the micro-switches 316 and 306 and packets of cigarettes are not in engagement with the micro-switches 300, 302 and 304, then no carton blanks are removed from the magazine.

(2) If only the micro-switch 300 is engaged by a packet, then one carton is fed from the magazine and for the two successive operating cycles, no carton blanks are fed from the magazine.

(3) If the micro-switches 300 and 302 are engaged by packets, then carton blanks are fed for two cycles, followed by an absence of a carton blank for the next cycle.

(4) If the micro-switches 300, 302 and 304 are engaged by packets, then carton blanks are fed for all operating cycles.

It will be appreciated that the packing machines supplying the conveyor belt 281 will vary in output and that variations in the number of packets present on the conveyor belt 260 will thus occur. Such variations are in many cases only of short duration and it is desirable to provide means whereby variation of the speed of operation of the packing device is effected only after a drop in the number of packets fed to the conveyor belt 260 has existed for a predetermined time, for example 5 to 10 seconds.

In order to achieve this, the circuit arrangement shown in FIG. 15 may be modified as shown in FIG. 17. In this figure, for the sake of simplicity, the relay R1 and its connection to relay R2 so that relay R2 can be effective only when the feeler of micro-switch 304 (see FIG. 16) has dropped, is not shown. The energization of the respective relays R2, R3 and R4 are the same as described for FIG. 15, and will not be further described. Also, the operation of the switches 318, 320, 322 and 324 is the same as described for FIG. 15.

Relay R2, which is energized when it is required to operate the packing device at 75% of its normal working speed, has a normally open contact set which, when closed, forms a connection T3'–429 to a time relay Z1 which is connected to T4' (T3' and T4' corresponding to T3 and T4 in FIG. 15). The time relay Z1 has a double-throw contact set which, when the time relay Z1 is not energized, or up to a given time after energization, forms a connection T4'–419 to the switch 324 so that the packing device continues to operate at its normal working speed. If, before the expiration of the said given time, the micro-switch 304 is operated by the presence of a packet thereunder, the relays R2 and Z1 are de-energized and thus the contact set of the time relay Z1 remains in its normal position. If, however, at the expiration of the given time, say 10 seconds, the micro-switch 304 has not been operated, then the time relay Z1 remains energized and its contact set is changed-over into a position in which a connection T4'–409 is established to the switch 322, so that regulation down to a speed of 75% of normal speed is effected.

Similarly, relay R3 is energized when regulation down to 50% of normal speed is required and relay R2 when regulation down to 25% of normal speed is required. Relay R3 has a contact set which forms a connection T3'–430 to a time relay Z2 and relay R4 has a contact set which forms a connection T3'–431 to a time relay Z3. Time relay Z2 has a double-throw contact set which in the normal position forms a connection T4'–412 to the switches 322 and 320 and in the off-normal position forms a connection T4'–413 to the switch 320. Time relay Z3 has a double-throw contact set which in the normal position forms a connection T4'–416 to the switch 320 and in the off-normal position forms a connection T4'–414 to the switch 318.

It should be clearly understood that the embodiment of the invention described and illustrated is given by way of example only. Many modifications, omissions and additions are possible without departing from the spirit of the invention.

We claim:

1. In and for a machine for packing groups of articles, which comprises a packing station, a first feed path, means for feeding groups of articles along said first feed path to said packing station, a second feed path, means for placing units of packing material successively onto said second feed path, means for feeding said units of packing material from said placing means along said second feed path to said packing station, said second feed path being of a length for accommodating thereon a plurality of said units of packing material, and means at said packing station for supplying said groups of articles to said units of packing material, one to each:

an arrangement for automatically controlling the operation of said machine, the arrangement comprising:

means for operating said placing means, a plurality of electric devices for sensing the presence and absence of groups of articles on said first feed path, said sensing devices being located along said first feed path and spaced one from the next for simultaneously sensing successive groups of articles when present on said first feed path, and an electric circuit for electrically interlinking said sensing devices with said operating means in such a manner that when only the sensing device nearest said packing station senses the presence of a group of articles said operating means is actuated and a single unit of packing material is placed by said placing means on said second feed path, that when only said nearest sensing device and its succeeding sensing device simultaneously sense the presence of two groups of articles, said operating means is actuated twice in succession and two units of packing material are placed in succession on said second feed path, and so on, said operating means being actuated successively without interruption so long as the last one of the sensing devices continues to sense the presence of a group of articles, the distance of said nearest sensing device from said packing station being such that whenever said operating means ceases to be actuated and therefore the placing of units of packing material on the second feed path is stopped, each

unit which at the moment of stopping is present on said second feed path is supplied at said packing station by said supplying means with a group of articles.

2. An arangement as defined in claim 1, wherein three sensing devices are provided, said second feed path being of a length for accommodating three units of packing material.

3. An arrangement as defined in claim 1, and comprising means for interrupting the operation of said supplying means, and a further electric device located for sensing the presence and absence of a unit of packing material at said packing station and ready for being supplied by said supplying means, said further sensing device being included in said electric circuit and interlinked with said means for interrupting the operation of said supplying means, so that a group of articles is only supplied when a unit of packing material is present at the packing station.

4. An arrangement as defined in claim 3, wherein the distance between said nearest sensing device from said packing station is such that when the supply of groups of articles to units of packing material is interrupted, at least one group of articles can be accommodated on said first feed path within said distance.

5. An arrangement as defined in claim 3, wherein said sensing devices include electric relays forming a relay chain for emitting electric control impulses actuating said means for operating said placing means.

6. An arrangement as defined in claim 5, wherein three devices for sensing the groups of articles are provided, each sensing device including a relay, the three relays, when responding simultaneously to the presence of successive groups of articles, actuating said operating means for successively placing units of packing material on said second feed path, whereas when only the relay of said nearest sensing device and the relay of the next sensing device respond said operating means is actuated only twice in succession and when only the relay of said nearest sensing device responds said operating means is actuated only once.

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