

Jan. 17, 1967

A. SCHMERMUND
APPARATUS FOR AUTOMATICALLY CHARGING
A CONTAINER WITH ROD-LIKE OBJECTS

3,298,549

Filed July 6, 1965

16 Sheets-Sheet 1

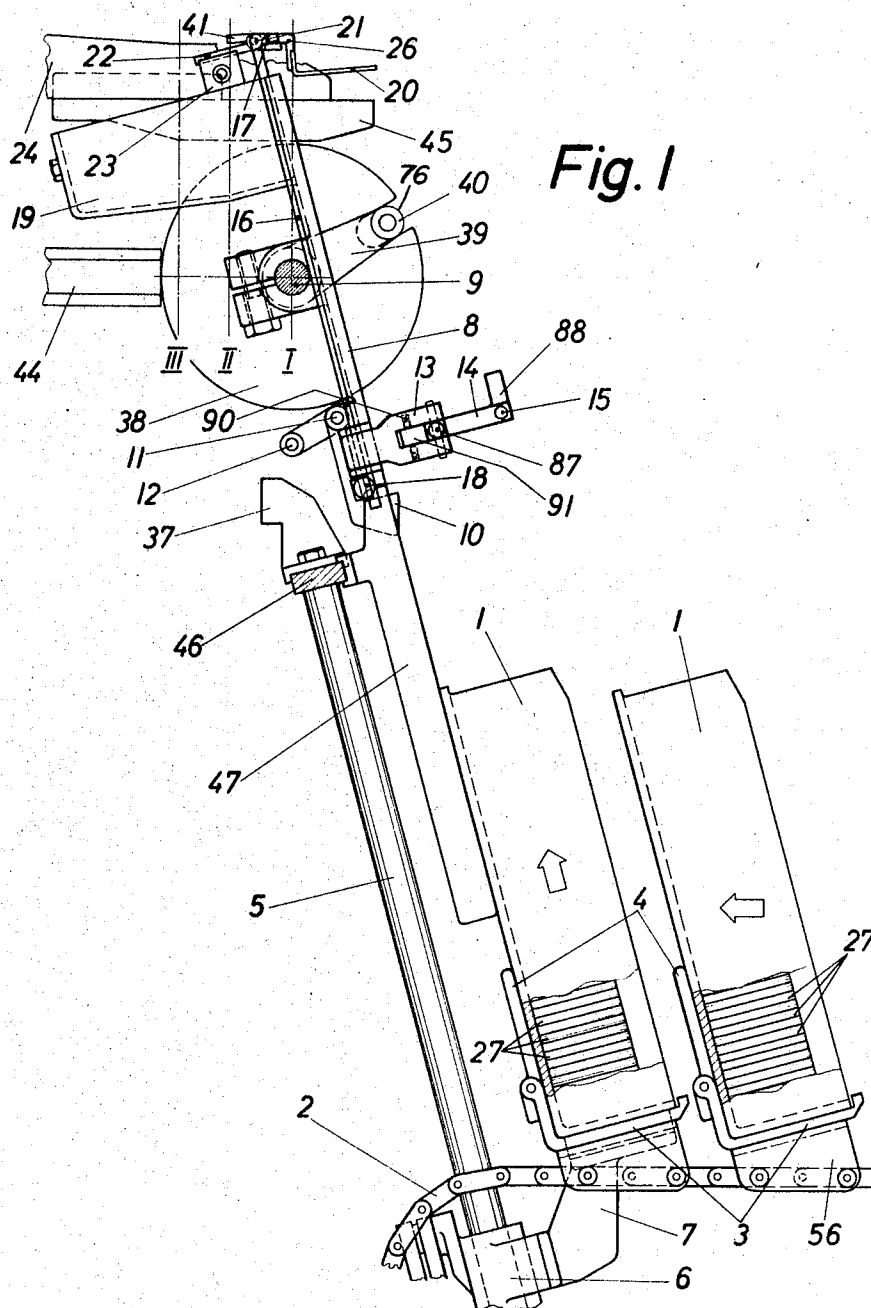


Fig. 1

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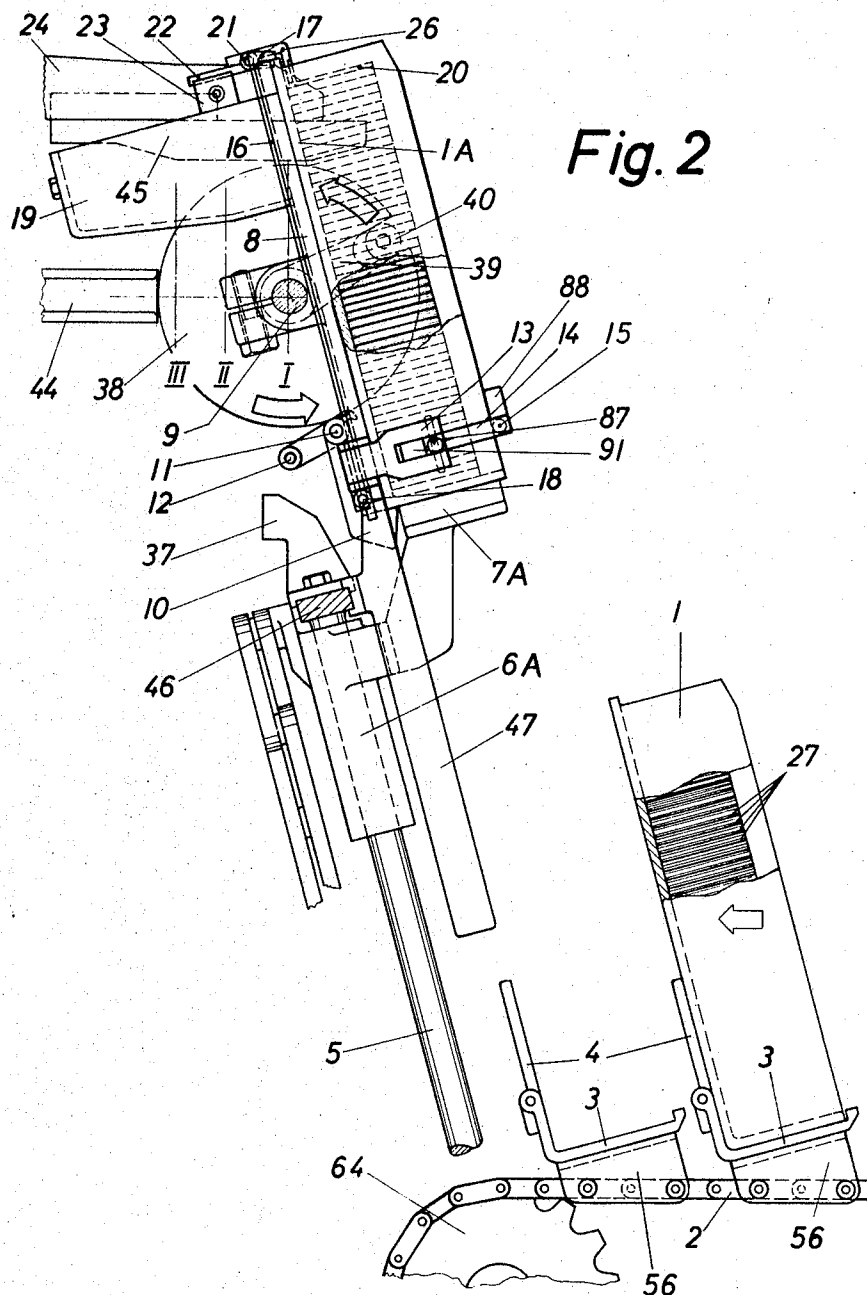
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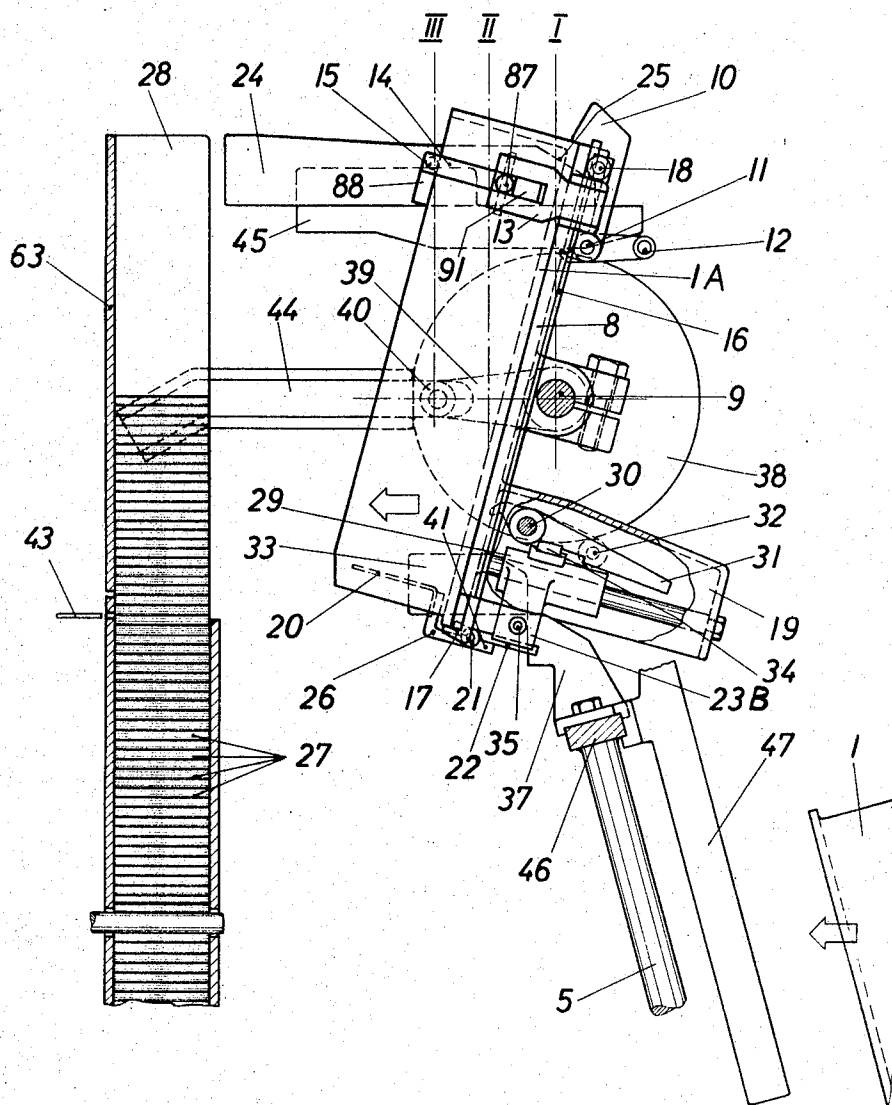
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Fig. 3



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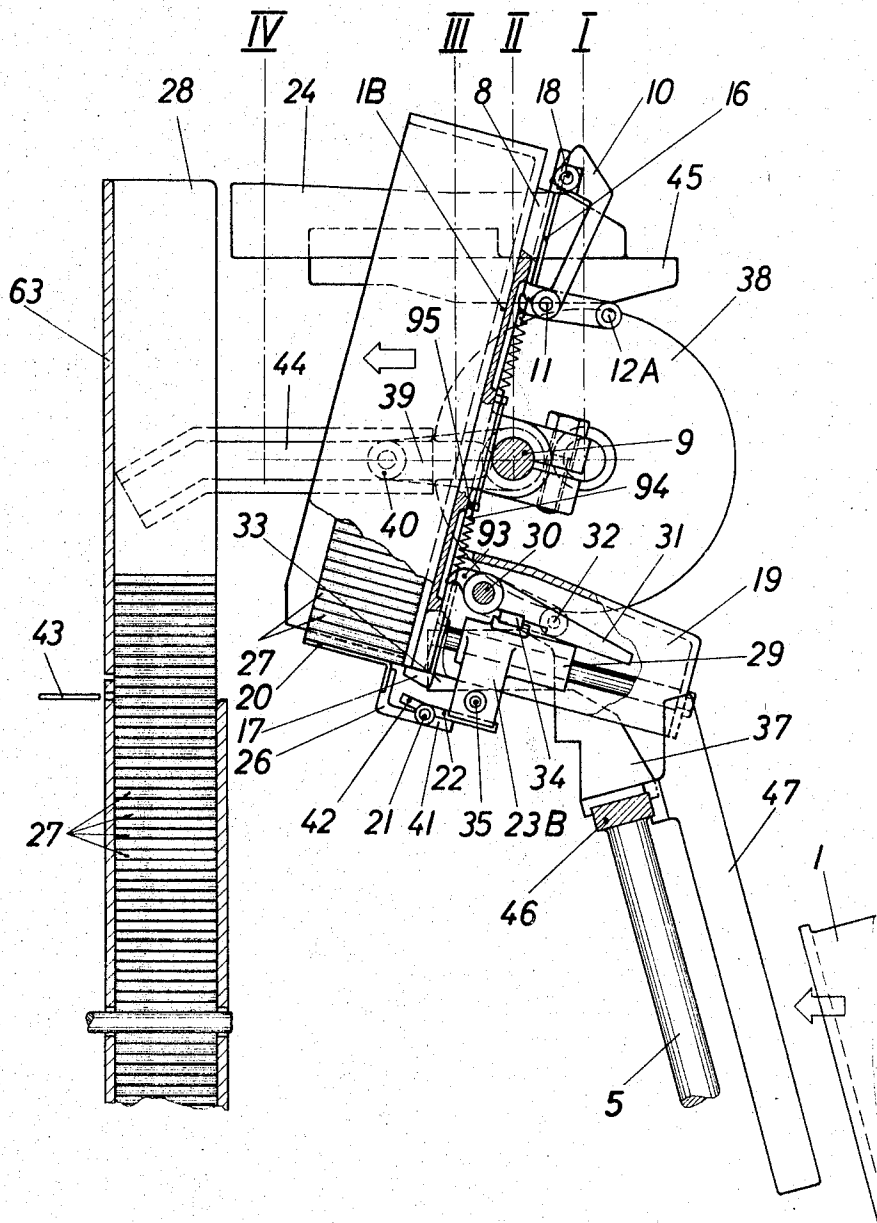
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Fig. 4



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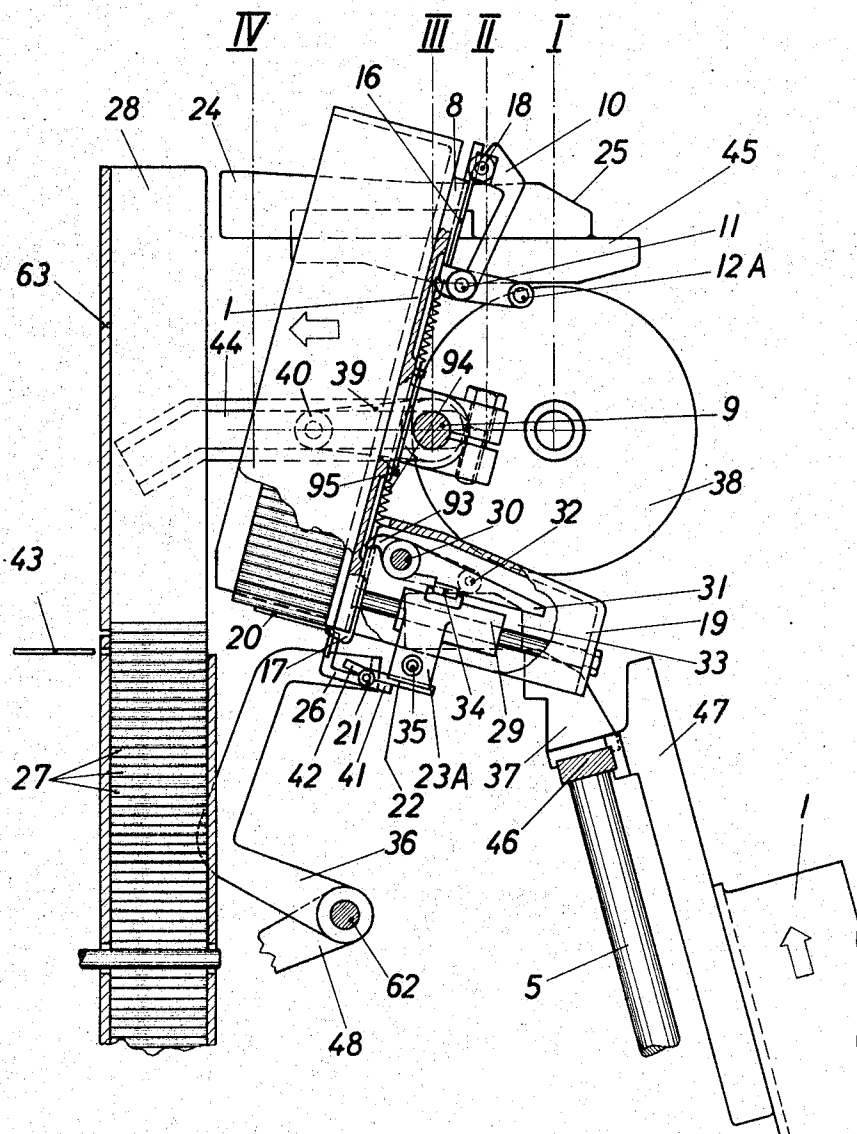
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Fig. 5



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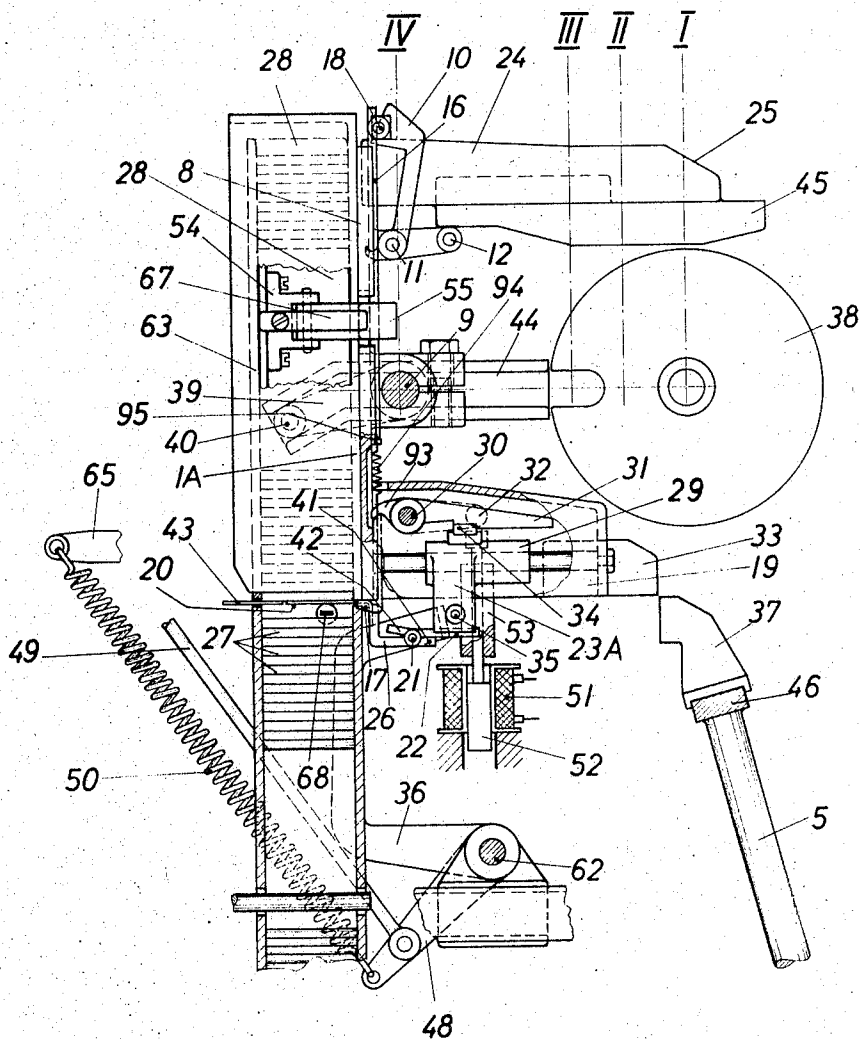
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Fig. 6



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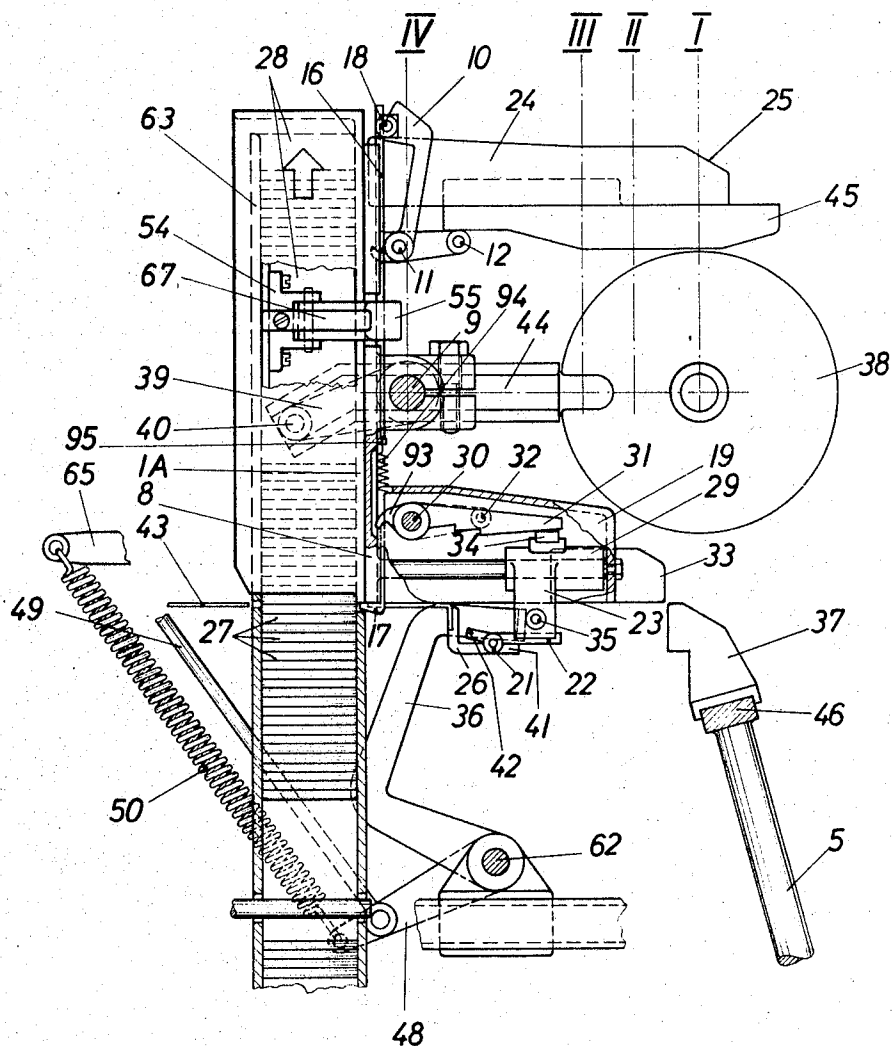
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Fig. 7



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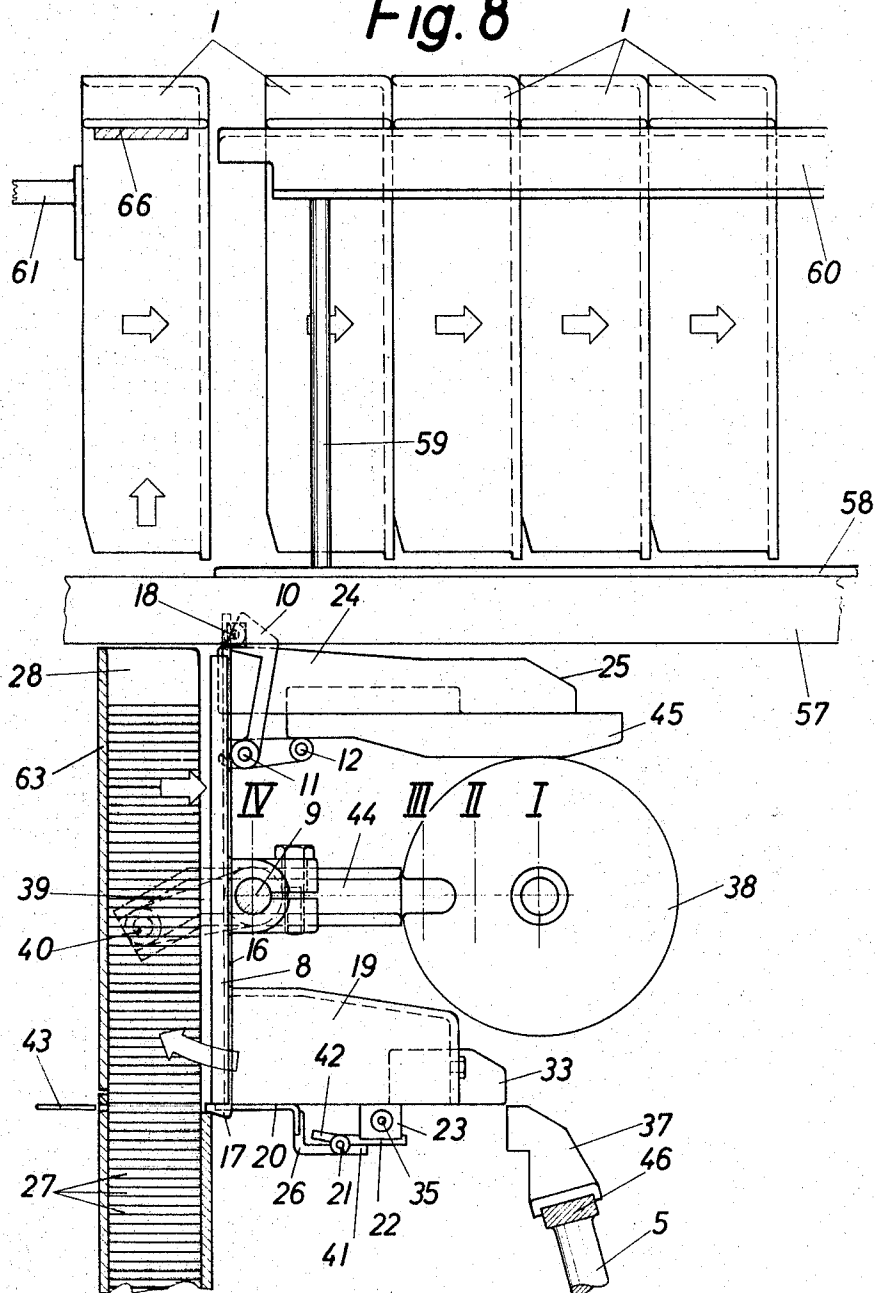
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Fig. 8



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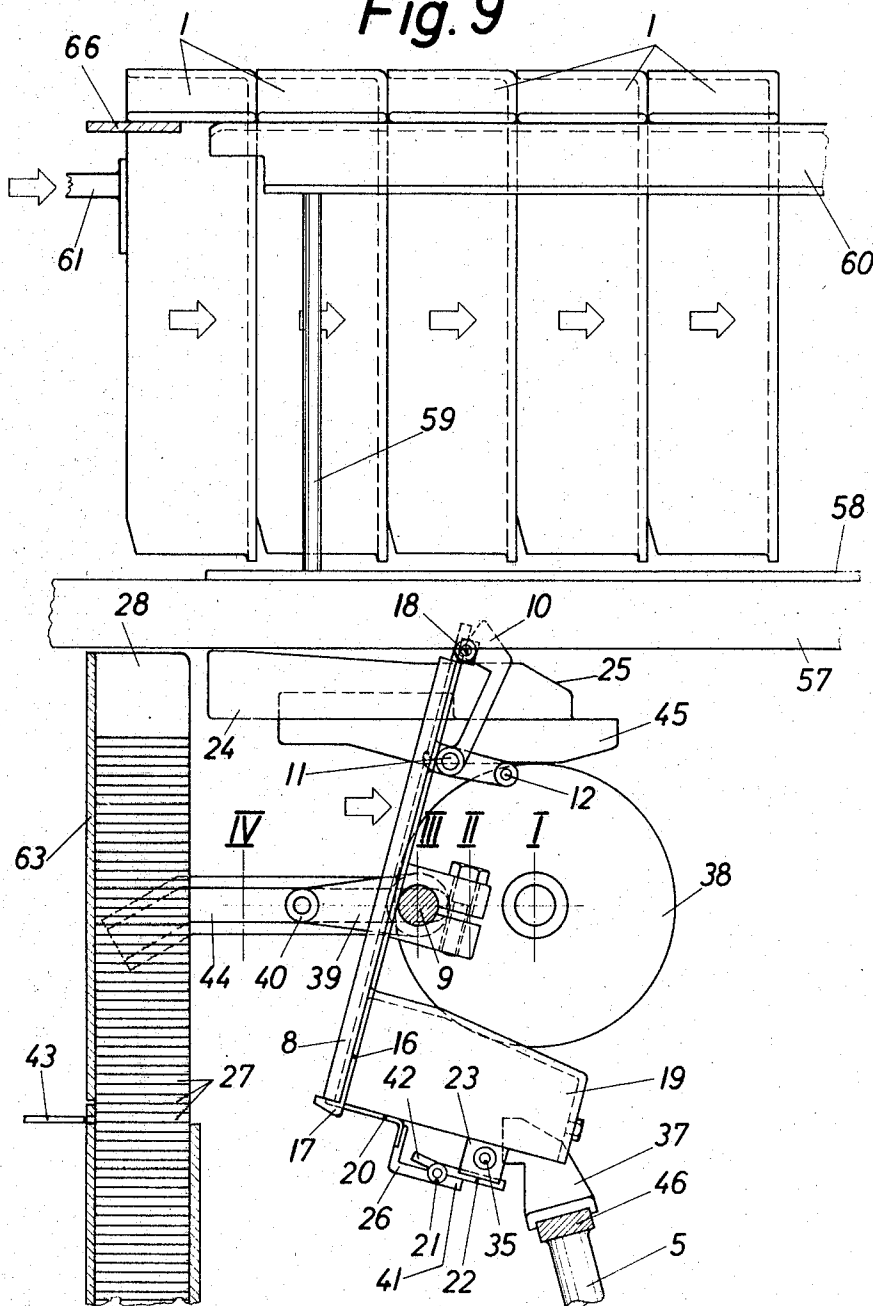
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Fig. 9



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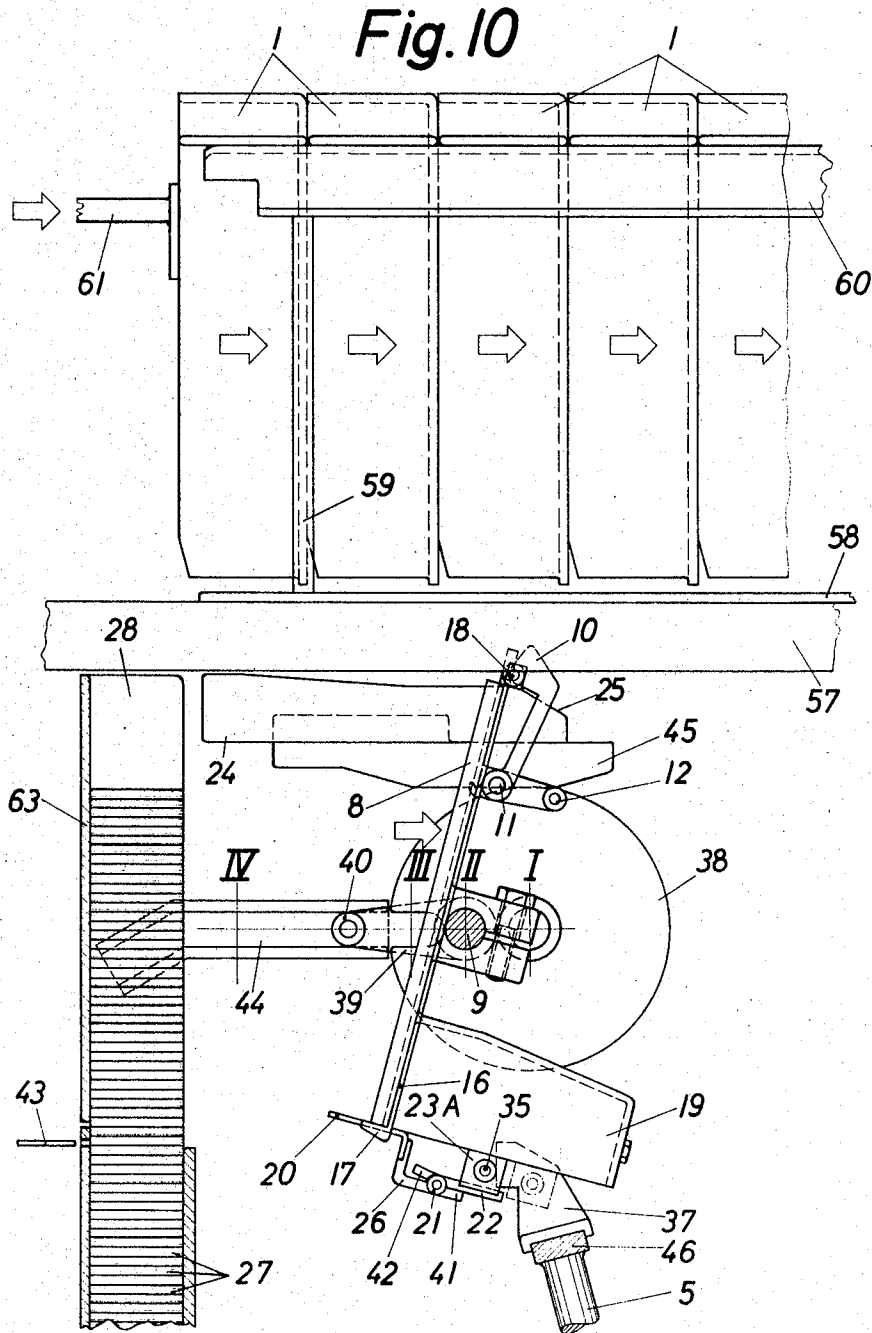
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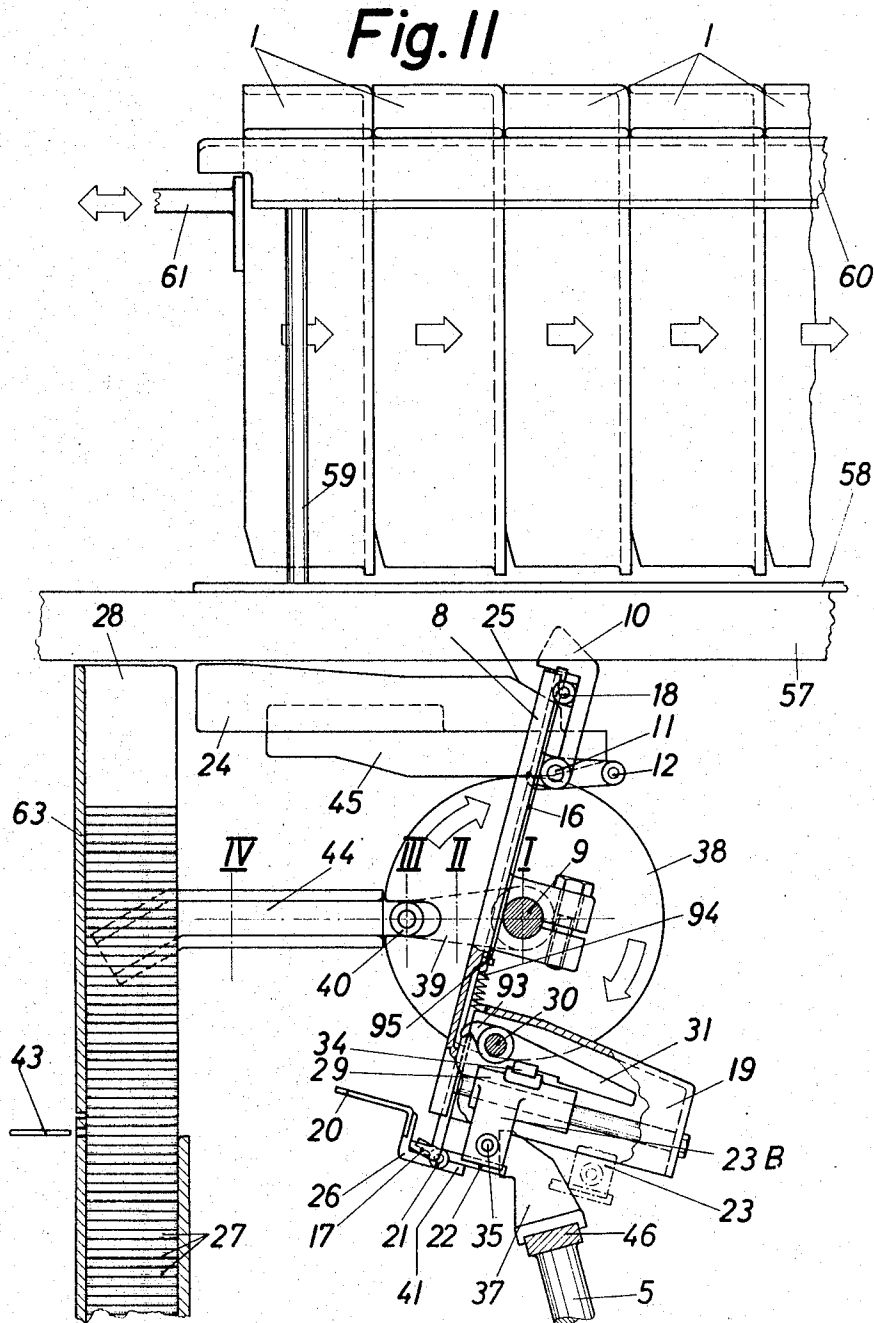
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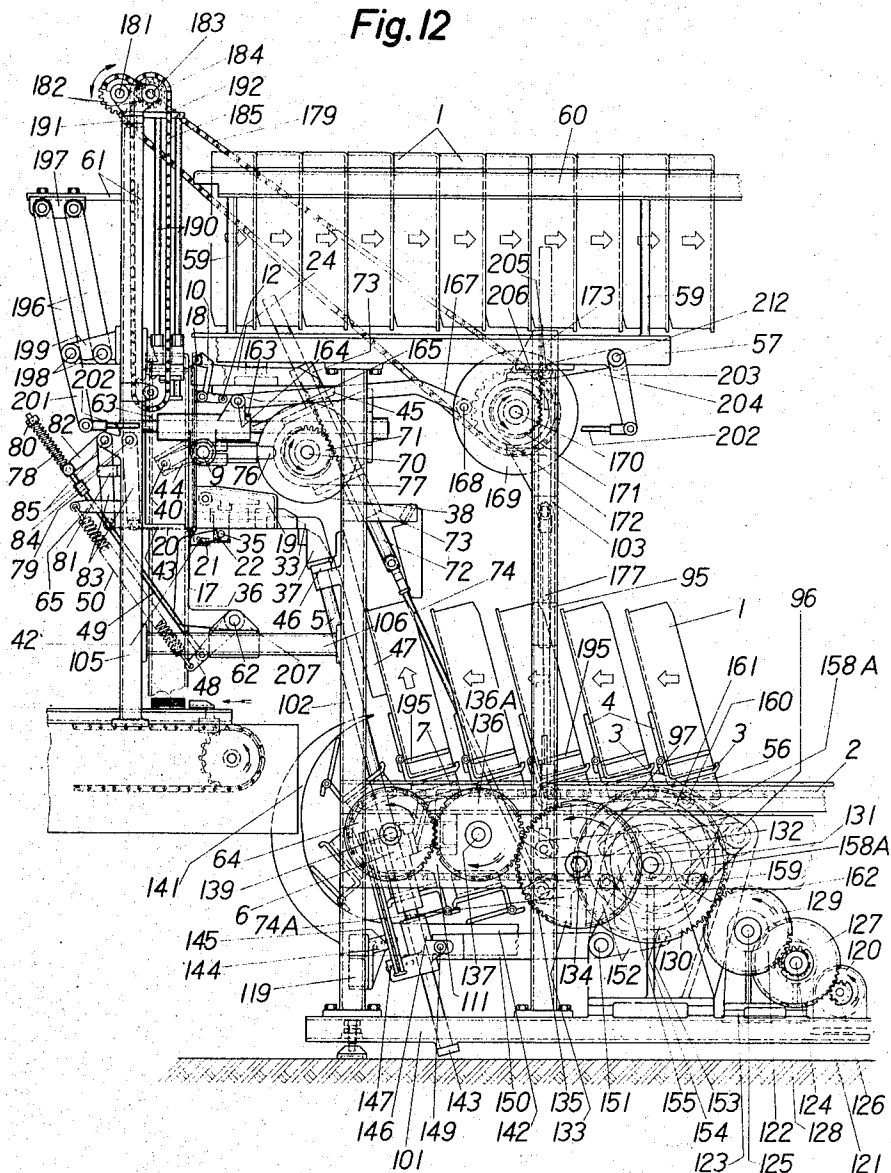
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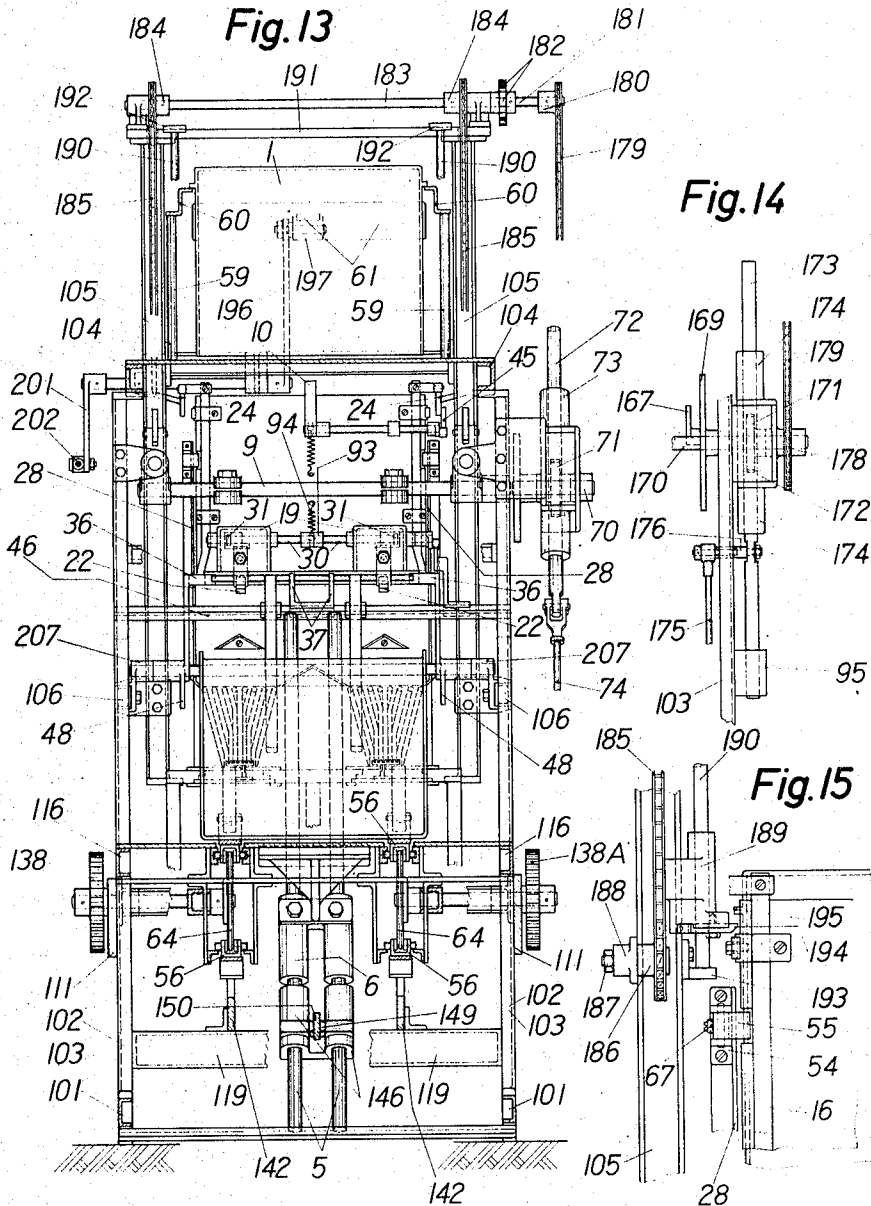
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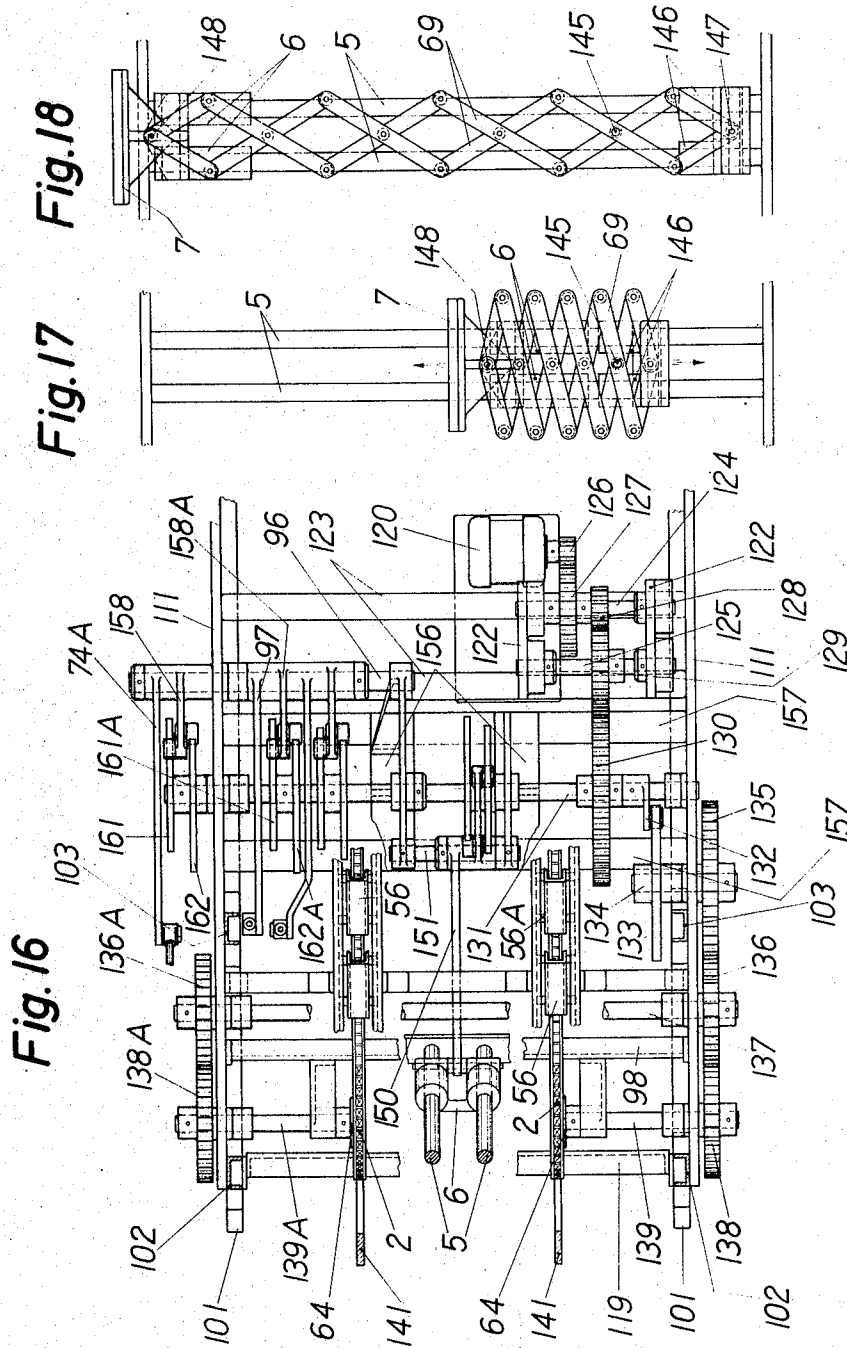
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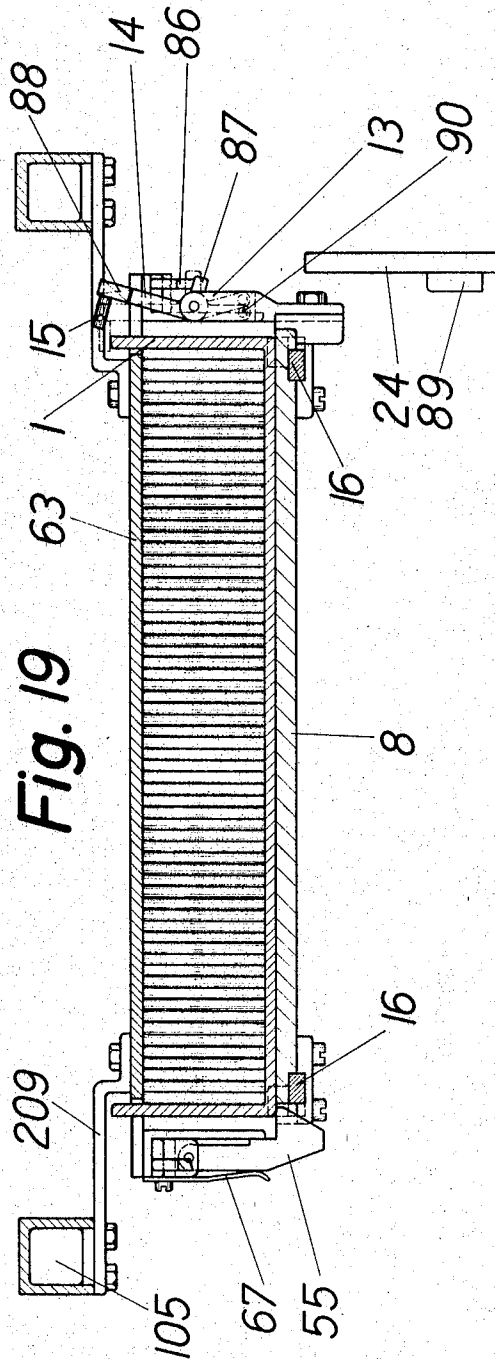


Fig. 19

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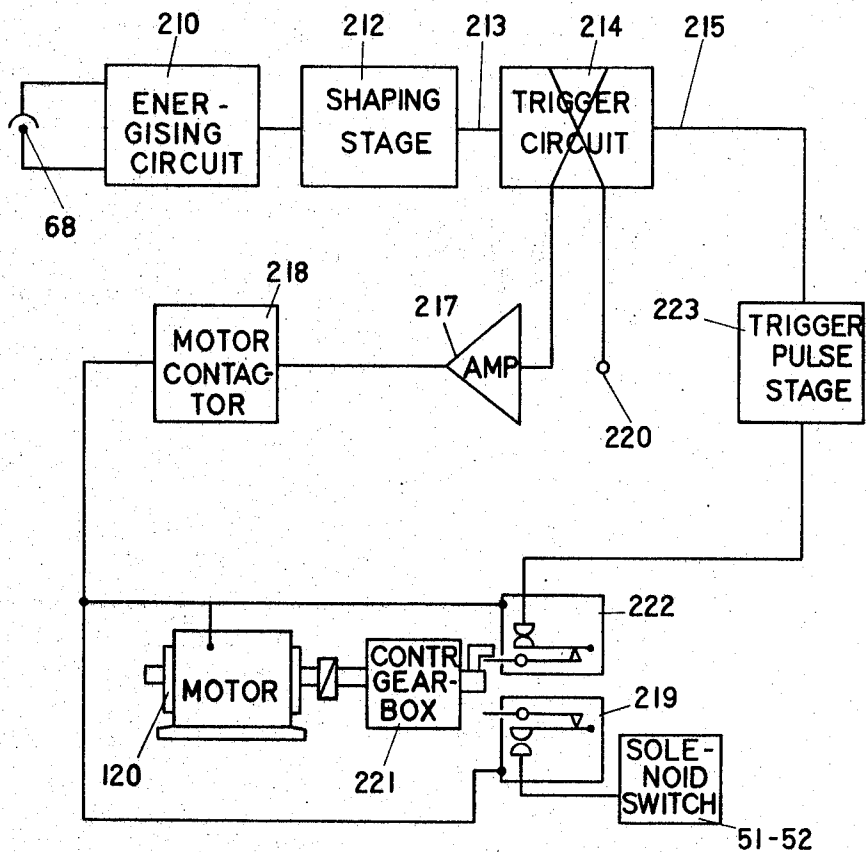


FIG. 20

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APPARATUS FOR AUTOMATICALLY CHARGING A CONTAINER WITH ROD-LIKE OBJECTS

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Filed July 6, 1965, Ser. No. 469,383

Claims priority, application Great Britain, Aug. 19, 1964,
33,818/64

6 Claims. (Cl. 214—307)

The invention relates to apparatus for automatically charging a hopper or the like container with rod-like objects of substantially equal cross-section and unitary length, such as cigarettes.

It is an object of the invention to provide an apparatus for automatically feeding cigarettes or other rod-like articles from rechargeable magazines to the hopper of a packing machine for such articles so that the level of the articles in the hopper is maintained between predetermined limits whilst articles are being continuously withdrawn from the lower end of the hopper for packing.

If, for example, cigarettes could be fed in precisely horizontal parallel relationship into the top of a hopper, wherein the distance between the back and front walls of the hopper, hereinafter called the width of the hopper, is a clearance fit for a column of horizontally stacked cigarettes, the above-mentioned object would be achieved. Difficulties arise, however, in the discharging of cigarettes from full magazines at the top of the hopper. The tipping of open-topped magazines of cigarettes above the hopper and the use of hinged bottom flaps for discharging cigarettes from the magazines, or the use of shaking devices for the magazines, may result in one or more of the cigarettes released from the magazine assuming an oblique position in the hopper, this leading to irregular stacking, jamming of the hopper and interruption of the production line.

Accordingly, it is another object of the invention to avoid or at least to reduce the above-mentioned disadvantages and to achieve precise and accurate packing and arrangement of rod-like articles such as cigarettes in the hopper, within reasonable limits.

These and other objects and advantages of the invention will become apparent from the following detailed description of the invention when read with reference to the accompanying drawings which are given by way of example and in which:

FIGS. 1 to 11 are diagrams illustrating the different phases in a complete operating cycle of the means for discharging a full magazine and showing the magazine in its various positions relative to the co-operating mechanisms.

FIG. 12 shows a side elevation of the entire apparatus.

FIG. 13 shows a front view of the apparatus.

FIG. 14 shows a part of the drive for a magazine tipping means which serves at the same time as the drive for elevating the empty magazine.

FIG. 15 shows a part of the elevating means for the empty magazines and of a latching device for the full magazines above the hopper.

FIG. 16 shows a plan view of part of the main drive including the driving motor and control gear.

FIG. 17 shows an elevating means for the filled magazines in the lower position.

FIG. 18 shows the same part of the apparatus as FIG. 17 but in the upper position.

FIG. 19 shows a sectional plan of a full magazine above the hopper of the packing machine with part of a latching mechanism.

FIG. 20 is a block schematic circuit diagram.

In the following description only so much of the apparatus will be described as is necessary for making clear

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the manner in which the full magazines are moved through the machine and presented at the various points thereof and the movements performed by the full magazines in their travel from the position upon the conveyor up to the final discharging station above the hopper.

Referring now to FIGS. 12 to 16 which show the general structure and arrangement of a cigarette packing machine, certain stationary parts of the framework whose function will be obvious from the drawing are indicated by the general references 98 to 106 and 111 to 117 and will not be referred to in the description.

The main driving gear, gear box and control mechanism is best seen in FIGS. 12 and 16, which show schematically a drive motor 120 whose pinion 126 drives through a spur gear train 127, 128, 129, 130 with suitable reduction to a main cam control shaft 131, wherefrom a crank 132 and six-section Maltese cross 133 transmit motion through a further gear train 135, 136, 138, and 136A, 138A to shafts 139, 139A.

The above mentioned main driving and control gear intermittently drives the main conveyor 2 carrying the magazines 1 and, through the main cam control shaft 131, drives the chains 179 and 185 for lifting the magazines, and the magazine tipping gear 70—75 as well as ancillary mechanism to be indicated in the following.

Upon the chain conveyor 2 passing round the sprockets 64 are pins 56a upon which are supported the chain guide members 56, which support the magazine clips 3 which carry the magazines 1 (see also FIGS. 1 and 2). Brackets 4 of the clips are spring linked so that at the end of the conveyor path the brackets can be folded over by a curved deflecting plate 141 (FIG. 12). At the other end of the conveyor the brackets 4 are released from the guide rail 142 by a similar arcuate deflector (not shown).

Upon a frame part there is centrally mounted a bearing 144 with a swivel pin 145 (FIGS. 12, 17, 18). This swivel pin 145 is the fixed pivoting point for the magazine elevating linkage represented in FIGS. 17 and 18. This elevating linkage has the function of conveying the filled magazine from its position at the left-hand end of the top track of conveyor 2 upwardly into a magazine receptacle 8 (FIGS. 1 to 11). For this purpose the linkage is designed, for example, somewhat similar to lazy tongs with one member thereof underneath the pin 145 and four members above said pin, whereby there is an amplification factor of the movement in the ratio 1:4. The lower member of the linkage is mounted at one end upon the pin 145 and at the other end by means of the pin 147 upon a carriage 146 which slides upon the guide rods 5.

The upper end of this linkage is pivotally secured by means of the pin 148 to another carriage 6, which likewise slides upon the guide rods 5. The carriage 6 supports the elevating platform 7 by means of which the filled magazine is elevated. The lower carriage 146 carries a pin with a roller 149 about which engages the slotted end of lever 150 (FIG. 12), which is mounted upon the shaft 151 and, by means of the rollers 153 of the roller lever arms 152, is driven by the cam discs 154, 155 mounted upon the main control shaft 131 and thus under the control of said cam discs moves the lower carriage 146 downwards as indicated by the arrow in FIG. 17, whereby the linkage 69 lifts the magazine into the receptacle 8 (FIG. 2).

The arrangement of the mechanism will now be described for tipping the magazine receptacle containing the already elevated magazine and transporting it through the positions indicated by the references I, II, III, IV in FIGS. 1 to 6.

The magazine receptacle 8 is pivotally mounted about a shaft 9 (FIGS. 12 and 13 and 1 to 11). The shaft 9 is also arranged to be horizontally displaceable through the positions indicated in the drawings by I, II, III and

IV. The receptacle 8 is a structure comprising a number of accessory devices for engaging the receptacle, tipping it through an appropriate angle into the inverted position and presenting it to the discharging position above the hopper. One of these devices is a pawl 10 which is mounted upon the pivot 11, and which can be operated externally of the receptacle by means of the roller lever 12. In FIG. 2 the magazine is held in position by the pawl 10. In this position the magazine is additionally held by the laterally position clips 13, 14 and by pin 15 (FIGS. 1 and 2).

At the sides of the framework of the magazine receptacle 8 there are mounted two retaining strips 16 which are displaceably mounted upon the receptacle and which, at one end, are bent over into the form of hooks 17 and at the other end carry a transverse member with a roller 18.

The function of the hooks 17 is to prevent the falling out of a magazine 1 when the magazine receptacle 8 is tipped out of the position of FIG. 2 through approximately 150° into the position of FIG. 3. These retaining strips 16 together with the parts 17 and 18 also have an additional function, namely, when the magazine receptacle 8 together with the magazine 1 is moved in the next step from the position I to II (FIGS. 3 and 4), the roller 18 runs over a ramp portion 25 of the fixed cam plate 24 and thereby lifts the magazine into the correct position.

The tipping mechanism is as follows:

Coaxial with the shaft 9 (FIGS. 1 to 11 and 13) there is situated at the right-hand side as seen in FIG. 13 the tipping shaft 70 with the tipping disc 38 which is provided with a slot 76 which, when the device is in position of FIG. 1, is engaged by the roller 40 of the lever 39 keyed to shaft 9. Thereby the shaft 9 is coupled to the shaft 70 in position I. The shaft 70 is mounted in the bearing housing 77 (FIG. 12) which is secured to the frame. Upon the shaft 70 there is mounted the pinion 71 in which engages the gear rack 72 guided in the sleeve 73 mounted on the bearing housing 77. To the gear rack 72 is linked the connecting rod 74, which itself is linked to the lever 74a mounted upon the pivot shaft 96, and the roller lever 158A connected thereto is operated in a known manner through rollers and the cam discs 161, 162 keyed to the main control shaft 131.

The reciprocating movement of the magazine receptacle is obtained by the slide 163 carrying the shaft 9. The shaft 170 carries the discs 169 arranged at each side thereof and operating as cranks by virtue of the connection of the crank pins 168 to the connecting rods 167 the other ends of which are linked to the slide 163 by pins 164.

The rotation of the crank discs 169 is effected by means of a pinion 171 (FIGS. 12 and 13) which is keyed upon the shaft 170 carried in the bearing housing 172 and is operated by means of a gear rack 173 which is slidable in the sleeves 174 integral with the housing 172 (see also FIG. 14) and in an additional bearing 104 situated upon the column 103. A connecting rod 175 is coupled by means of a pin 176 with the gear rack 173 and passes through a slot 177 in the column 103 forming part of the machine frame.

The connecting rod 175 is linked to the lever 97 which is mounted upon the shaft 96 and whose roller lever 158A is operated by means of the cam discs 161A, 162A (FIG. 16) mounted upon the main control shaft 131.

The drive from shaft 170 also serves to operate a further magazine lifting gear. Upon the shaft 170 there is keyed the sprocket 178 which drives the chain 179 passing also round the sprocket 180 upon the shaft 181 (FIGS. 12, 13 and 14). The shaft 181 drives the shaft 183 through a pair of gears 182 which provide the correct gear ratio and the correct direction of rotation for two sprockets 184 keyed to the shaft 183 and carrying endless chains 185, which are also guided over idle running sprockets 186 (FIG. 15), which are mounted upon pins 187 carried in bearing brushes 188 secured to the frame parts 105.

The chains 185 are connected to slides 189 (FIG. 15)

which slide upon guide rods 190, which are fixed relative to the framework.

The slides 189 carry stops 194 which engage under the laterally projecting lifting strips 195 of the magazine 1 in order to elevate the latter after it has been discharged (FIG. 8). This movement is suitably timed in relation to the other steps in the cycle due to the connection between the shaft 170 above described and the main cam shaft.

The operation of the apparatus so far described may be briefly summarized as follows: Full magazines 1 are successively placed for example manually, onto magazine clips 3 which carry to magazines 1 horizontally in the direction indicated by arrows in FIG. 12. The magazines 1 are somewhat inclined with their open end uppermost. They are then successively elevated by the platform 7 of the elevating linkage (see also FIGS. 17 and 18), and are received by the magazine receptacle 8 (see FIGS. 1 to 11) which together with the magazine therein is turned from the position of FIG. 2 to the position of FIG. 3 by the tipping mechanism described and is moved through the positions of FIGS. 4 and 5 into the position of FIG. 6 in which the magazine is vertical and is located above the hopper in inverted position, the cigarettes being retained in the magazine by means to be described hereinafter. The cigarettes are subsequently discharged into the hopper, the empty magazine being lifted and removed. The magazine receptacle 8 is returned into the position shown in FIG. 1 and is ready to receive the next full magazine 1.

The mechanism for discharging the full magazine will now be indicated.

The magazine receptacle 8 carries a cover plate 20 which, after the magazine has been rotated through about 150° by the tipping mechanism (FIG. 4) can serve as a base plate to support the cigarettes 27. This cover plate 20 is mounted upon a bracket 26 which is pivotable about a pivot pin 21. This device is carried on a support 22 adjacent a boss 23 (FIG. 7) connected to a slider 29, the other positions adopted by the boss 23 being indicated by 23A and 23B in FIGS. 3 to 11. The slider 29 is carried within a housing 19 fixed to the magazine receptacle 8. The boss 23 carries a latch roller 35 engageable with one end of a U-shaped latch lever 36 pivoted about a pivot pin 62 (FIGS. 7 and 12) carried in a fixed bracket 207. The latch lever 36 has a lever arm 48 which, when the parts are in the position shown in FIG. 12, tensions a spring 50 anchored to a fixed lug 65 and is itself linked to a rod 49 having a compression spring 78 constrained between a stop collar 80 and a boss carried at the end of a lever 82 linked at 85 to parallelogram levers 83. The rod 49 slides through the boss carried at the end of lever 82 and is drawn into a position in which there is a space between said lever 82 and a further stop collar 79 on the rod 49, such space representing lost motion between the rod 49 and the lever 82 before the collar strikes the lever 82 and turns it clockwise when the rod 49 is returned by the tension of spring 50 upon release of latch lever 36.

32 is a roller-type trip lever pivoted at 30, and 93 is a lever nose anchored to a tension spring 94 which is connected at point 95. 31 is a pawl notched to engage with a stop 34 carried by the slider 29.

A sliding shutter 43 linked to the parallelogram linkage 83 is arranged to be horizontally displaceable into and out of the hopper through a slot in the rear wall 63.

The sequence of operations performed by the magazine receptacle and the magazine will now be described with reference to FIGS. 1 to 12.

It will be assumed that the motor 120 and the drive with the associated controls are in operation and that the magazine receptacle has been rotated from the position of FIG. 2 through about 150° as above described into the position of FIG. 3. During this time the cover plate 20, which, in FIG. 2, covers the top of the cigarette stack, now forms the base support plate and is within the side walls of the magazine receptacle. Roller lever 12 pivoted at 11

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is on the beginning of the track of the fixed cam plate 45 and roller 18 is on the beginning of the ramp 25 of the fixed cam plate 24.

This arrangement has the following purpose: The cigarettes initially rest in the magazine 1 filling it to the upper edge thereof, but the level of the cigarettes therein will have been lowered materially by vibration in the transport of the magazine (by about 20 to 30 mm.). Upon tipping the magazine from top to bottom through for example 150° (FIGS. 2 and 3) the cigarettes would fall inside the magazine if there were an air gap of 20 to 30 mm. between the base plate 20 and the level of the cigarettes. Consequently the base plate 20 together with the holding mechanism 21, 22, 23, 26 is so designed that the base plate 20, which is pivotally suspended at the point 21, can project inside the magazine in the positions shown in FIGS. 2 and 3 and thus bridge over the gap of 20 to 30 mm.

In passing from the position of FIG. 3 to FIG. 4, the magazine receptacle travels from position I to position II and the magazine is lifted relative to the base plate 20 by the roller 18 sliding along the ramp 25. Now the lower edge of the magazine is flush with the base plate 20 (FIG. 4) so that the base plate 20 can be rapidly withdrawn from underneath the magazine as will be later described.

Also in passing from position I to position II, the magazine receptacle 8 is guided by roller 40 of lever 39 entering guide track 44 from the previously aligned position of FIG. 3. Slider 29 remains latched in the left-hand position by pawl 31, the lever nose 93 of trip lever 32 remaining under the tension of spring 94.

Shaft 9 on carriage 163 continues to be driven parallel with guides 165 by connecting rods 167 and cranks 169 (FIG. 12) and comes into position III (FIG. 5), wherein pawl 31 has been partially released by trip lever 32 so that stop 34 is in the last notch of the pawl 31. No further motion takes place in the mechanism from this position unless and until there is a fall in the level of the cigarettes in the hopper 28.

This fall in the level will be due to extraction of cigarettes from the lower part of the hopper 28 and is used to initiate further operation of the mechanism. The control is automatically exercised by a photo-electric control circuit represented in simplified form by the photo-cell 68 in FIG. 6. When the level falls somewhat below that shown in FIG. 5, the photo-cell delivers a pulse, the result of which is that the motion of the receptacle 8 takes place from position III to IV (FIG. 6) whereby the magazine is inserted in the cigarette hopper 28. Simultaneously the auxiliary closure member in the form of the sliding shutter 43 associated with the hopper is pushed forward by the parallelogram linkage 83 (FIG. 12) and assumes the position underneath the magazine shown in FIG. 6, so that the cigarettes are now jointly supported by the parts 20 and 43. The base plate 20 bears the entire weight of the load in FIG. 5, wherein the stop 41 of the hinged bracket 26 holds the base plate 20 precisely in position of FIG. 5 by bearing against the part 22. It will be observed that, due to the action of the two-stage locking pawl 31, the base plate 20 has been retracted from its original position to allow room for both the base plate 20 and the shutter 43 to be inserted into the hopper. This movement of the base plate 20 is effected in performing the movement from position II to position III, when the roller of the roller trip lever 32 rolls upon the stationary deflector plate 33 (FIG. 3) so that the pawl 31 moves upwardly only a sufficient distance to release the stop 34 out of the first locking notch and locks it again in the second notch.

In performing the motion from position III to position IV (FIG. 6) the latch roller 35 of the slider 29 has run against the end of the latch lever 36 and has moved this counterclockwise into its end position placing the tension spring 50 under tension, as already described and shown in FIGS. 6 and 12. Immediately the receptacle 8 has reached the position of FIG. 6, a suitable device,

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for example a micro-switch (not shown) causes an electromagnet 51 to receive a pulse. The plunger 52 forces the roller of the trip lever 32 to rise and release the locking pawl 31. Now under the traction action of the released tension spring 50 the slider 29 together with the base plate 20 is displaced rapidly outwards.

However, the second closure component for the magazine, namely the shutter plate 43, does not perform an equivalent movement to the base plate when being drawn outwards. This is because the motion of the plates 20 and 43 in opposite directions must be so timed that these components release opposite ends of the stack of cigarettes at the same instant. This has the advantage that the stack of cigarettes moves vertically downwards as a whole and that any separation or turning of the cigarettes is avoided. Furthermore, due to the fact, already mentioned, that the trip lever 32 is operated immediately the magazine receptacle has reached the position of FIG. 6, the contents of the magazine fall only through a small distance.

The means for timing the relative movements of the components 20 and 43 will now be referred to.

When the locking pawl 31 is released the latch lever 36 springs back being driven by the tension spring 50 and carries with it the slide 29 and the base plate 20, but the shutter 43 does not begin to move at the same time as the base plate 20. A short delay is introduced by the lost motion between the rod 49 and the lever 82. After the stop collar 79 (FIG. 12) has taken up this lost motion, it strikes the boss at the end of the lever 82. At this point the base plate 20 and the shutter plate 43 may project by the same distance at each side under the stack of cigarettes. This means that the base plate 20 and the shutter 43 may then fly apart with equal and opposite speeds that the whole of the stack of cigarettes in the magazine is released by the parts 20 and 43 at the same instant. However, it will be understood that the speeds of movement of the parts 20 and 43 can be suitably chosen by the dimensions and design of the linkages (such as 83) to obtain the desirable result of simultaneous release of the charge at both sides thereof.

It has been explained that when the magazine is set up in the position shown in FIG. 6 the magnet 51 is operated through a micro switch. However, it will be understood that any other convenient means may be used for moving the trip lever 32.

For example, as an alternative form of release mechanism, the magnet 51, 52 may be omitted and the trip lever 32 may be operated only mechanically. This may be effected at the instant when the magazine reaches its discharging position as shown in FIG. 6, by causing a stop (not shown in the drawing) to actuate the trip lever 32 in the final part of the movement of the magazine. This kind of mechanical control naturally requires a very precise adjustment of the trip lever 32 and pawl 31 and may result in heavier wear upon the latching surfaces of the lever 31, whereas known types of micro-switch can operate with very small movement ranges and very small operating forces to the advantage of the mechanism which is being controlled.

FIG. 7 shows the extreme end positions of the base plate 20 and the shutter 43 and the stack of cigarettes lowered into the hopper. The magazine must now be held temporarily whilst the magazine receptacle is moved back.

This holding of the magazine is the function of a snap action mechanism in the form of a pawl 55 (FIGS. 6, 7, 15 and 19) movably mounted by means of the retaining member 54 upon the hopper wall 63 and positioned laterally of the magazine receptacle 8 in the plane of the upwardly extending side walls 28 of the hopper and held in the operative position by leaf springs 67. Upon being set up in the hopper the magazine deflects the snap action mechanism, which snaps in behind the magazine and so prevents the magazine from tipping back when the magazine receptacle 8 is moved away.

The rear wall 63 of the hopper has an upper part which is narrower than the magazine 1 so that the magazine embraces that part of the rear wall. The rear wall 63 is secured by means of the brackets 209 to the frame part 105.

The empty magazine is now drawn upwardly into the position of FIG. 8 by means of the conveyor 185 and the mechanism already described with reference to FIGS. 12 and 15. The magazine receptacle 8 can now be moved and returned into the original receiving position. This is performed in phases which are illustrated in the lower parts of FIGS. 9, 10 and 11 and a final phase wherein the receptacle is rotated back through 150° to assume a position equivalent to FIG. 1. It will be understood that during the return movement of the magazine receptacle 8, the same and the ancillary mechanism is restored to the FIG. 1 position by the sequence of movements represented by IV, III, II, I and a tipping operation, i.e. the reverse of the sequence previously described, and these restoring movements will not be described in detail. For example, the roller trip lever 32 again travels over the deflector plate 33 whereby the base plate 20 and slider 29 are restored with the stop member 34 again locked in the first locking notch of the locking pawl 31. Likewise the rollers 12 and 18 move over the respective stationary guide members 45 and 24 in the downward direction to restore the initial position.

Meanwhile the empty magazine in FIG. 8 is dealt with by a pusher mechanism (upper parts of FIGS. 8 to 11, and FIG. 12).

The pusher 61 is connected by means of a pivot block 197 to the lever parallelogram linkage 196 whose levers 196 are secured to shafts 198. The shafts 198 are supported in the bearings 199 (which are connected to the frame parts 105). Operatively connected to one of the levers 196, through one of the shafts 198, is a lever 201 upon which engages the push rod 202, which, at the other end (FIG. 12), is connected to the lever 203, which is pivoted at 212 and whose roller lever arm 20 has a roller 205 which is driven by the cam disc 206, which is mounted upon the shaft 170. In this way intermittent motion is imparted to the pusher 61 which displaces the magazines along slide rails 60 which are secured by means of the bearers 59 to the frame parts 104 (FIGS. 12 and 13).

The schematic circuit of FIG. 20 comprises well known electrical and electronic components and may be designed to operate upon the delivery of an output pulse from the hopper photo-cell 68. It will be understood that the whole apparatus remains static in the position of FIG. 5 until such pulse is delivered. This pulse is fed to the amplifier energising circuit 210, wherefrom connection is made to a shaping stage 212 producing a negative going step function whenever the control signal reaches a minimum predetermined value resulting from the illumination of the photo-cell. This step function output is applied through a lead 213 to a known type of bistable trigger circuit 214. The trigger circuit 214 has a connection to a power amplifier 217 and thence to a motor contactor 218 controlling the drive represented by the motor 120, which through known transmission means, drives the control gear box 221. It will be understood that included in the schematic control gear box shown at 221 in FIG. 20 there will be gearing equivalent to that already described above including the control shaft 131 and the associated transmissions (FIG. 12). A micro-switch 219 is shown with a schematic mechanically timed connection from the gear box 221, this being representative of the operation of the micro-switch when the magazine receptacle 8 comes into the final discharging position (FIG. 6). The micro-switch operates the solenoid 51-52 to actuate the trip lever 32 (FIG. 7). A cycle of operations is thus started. For arresting the apparatus in the FIG. 5 condition, a further micro-switch 222 may be used with a connection to a trigger pulse stage 223 from which there is applied through the connection 215 a negative going trigger pulse for restoring the trigger circuit 214 to its first stable condition. The trigger circuit 214 is a known type of circuit which

can be triggered from a first stable condition to a second stable condition on receipt of a negative going signal from 213 and can be triggered from this second stable position to the first position on receipt of a negative going signal over lead 215. The trigger circuit outputs may be alternatively of zero and negative potential. When in the first stable condition the trigger circuit delivers an output of negative polarity to the power amplifier 217. The trigger circuit may have a similar power amplifier connected to the terminals 220 if it is desired to control other equipment, e.g. any equipment at the discharge end of the hopper, dependent upon the trigger circuit first and second stable conditions. It will be understood that the drive, including the motor 120, may be associated with conventional clutching devices in the mechanical transmission equipment. However, once a cycle is begun, the steps proceed automatically since the timing of the steps is positively related by the trains of gearing already described in connection with FIGS. 12 to 16.

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

I claim:

1. An apparatus for automatically replenishing a vertical hopper from magazines, comprising conveyor means for feeding magazines in succession to a discharging position vertically above said hopper, releasable closure means for said magazines for supporting columns of cigarettes therein when said closure means are closed, said closure means comprising two separate plate components situated in a common horizontal plane, means for separating said plate components and thereby releasing said closure means so that said plate components simultaneously withdraw their support from opposite sides of the column of cigarettes in a particular magazine, whereby said column of cigarettes is unsupported over its entire width and is enabled to descend as a whole into said hopper whilst maintaining parallel horizontal relationship of the cigarettes, a magazine receptacle for placing said particular magazine vertically above said hopper, said releasable closure means comprising a first plate component forming a temporary base plate carried by said magazine receptacle and a second plate component forming a shutter associated with said hopper, and a mechanism for operating said first and second plate components, said first and second plate components being initially arranged to cover different portions of the magazine width to support said column of cigarettes in said magazine at the bottom of said magazine over different portions of length of said cigarettes, said operating mechanism being arranged first to displace said first plate components to separate it from said second plate component by a distance such that said plate components assume symmetrical positions relative to said column of cigarettes supported thereby, whereafter said operating means further separate said first and second plate components in unison to complete the release of said column of cigarettes from said particular magazine, said operating mechanism comprising first means for displacing said first plate component, second means for displacing said second plate component, and connecting means between said first and second displacing means, said connecting means including a lost motion device for causing said second displacing means to be operated only when said first and second plate components occupy said symmetrical positions with respect to said column of cigarettes in said particular magazine.

2. An apparatus for automatically replenishing a hopper from magazines, the apparatus comprising a magazine receptacle for placing one of said magazines above said hopper, a first plate component carried by said magazine receptacle, a second plate component associated with said hopper, said first and second plate components being situated in a common plane, when said one magazine has been placed above said hopper by said mag-

azine receptacle, and being arranged for covering different portions of the magazine width to support a column of elongated articles in said one magazine at the bottom thereof over different portions of length of said articles, and a mechanism for displacing said first and second plate components in said common plane to opening said one magazine and to allow articles therein to drop into said hopper, said displacing mechanism including first means for displacing said first plate component, second means for displacing said second plate component, and delay means for delaying the operation of said second displacing means after the start of operation of said first displacing means until said first displacing means have displaced said first plate component to separate it from said second plate component by a distance such that said plate components assume symmetrical positions relative to said column of articles whereafter said first and second displacing means operate to further separate said first and second plate components in unison to complete the release of said column of articles from said magazine.

3. An apparatus as defined in claim 2, wherein said delay means comprise a lost motion device.

4. An apparatus as defined in claim 2, wherein said first plate component is movably connected to said magazine receptacle and shaped to be initially located in said one magazine, means being provided for moving said mag-

azine receptacle with said one magazine therein and said first plate component relatively to each other so that said first plate component is withdrawn from and positioned outside said one magazine before it is displaced in said common plane.

5. An apparatus as defined in claim 2, and further comprising means for holding said magazine receptacle with said one magazine therein initially in a position inclined relatively to said hopper, and means for turning said magazine receptacle with said one magazine into alignment with said hopper.

6. An apparatus as defined in claim 3, wherein said lost motion device includes spring means, means for tensioning said spring means, and means for releasing said spring means when said first and second plate components occupy said symmetrical positions, said spring means being arranged for moving said first and second plate components by a snap action.

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