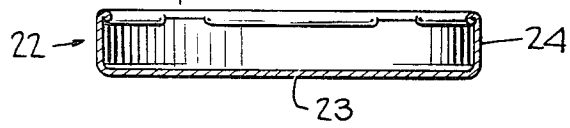
Dec. 15, 1970 D. D. ACTON ET AL 3,546,768

REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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Fig. 9.



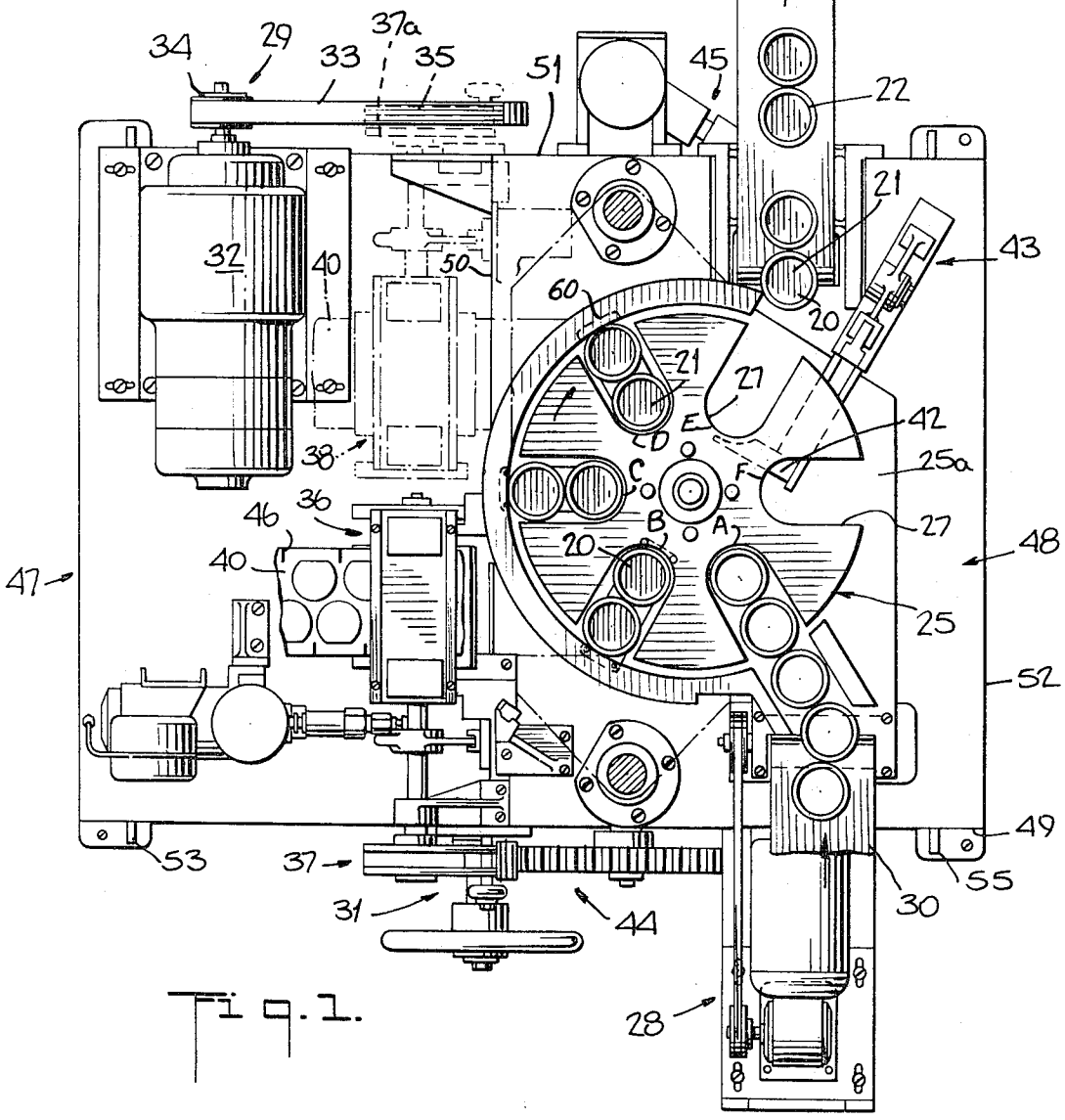
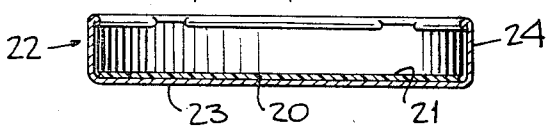


Fig. 1.

Fig. 10.



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REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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Fig. 2.

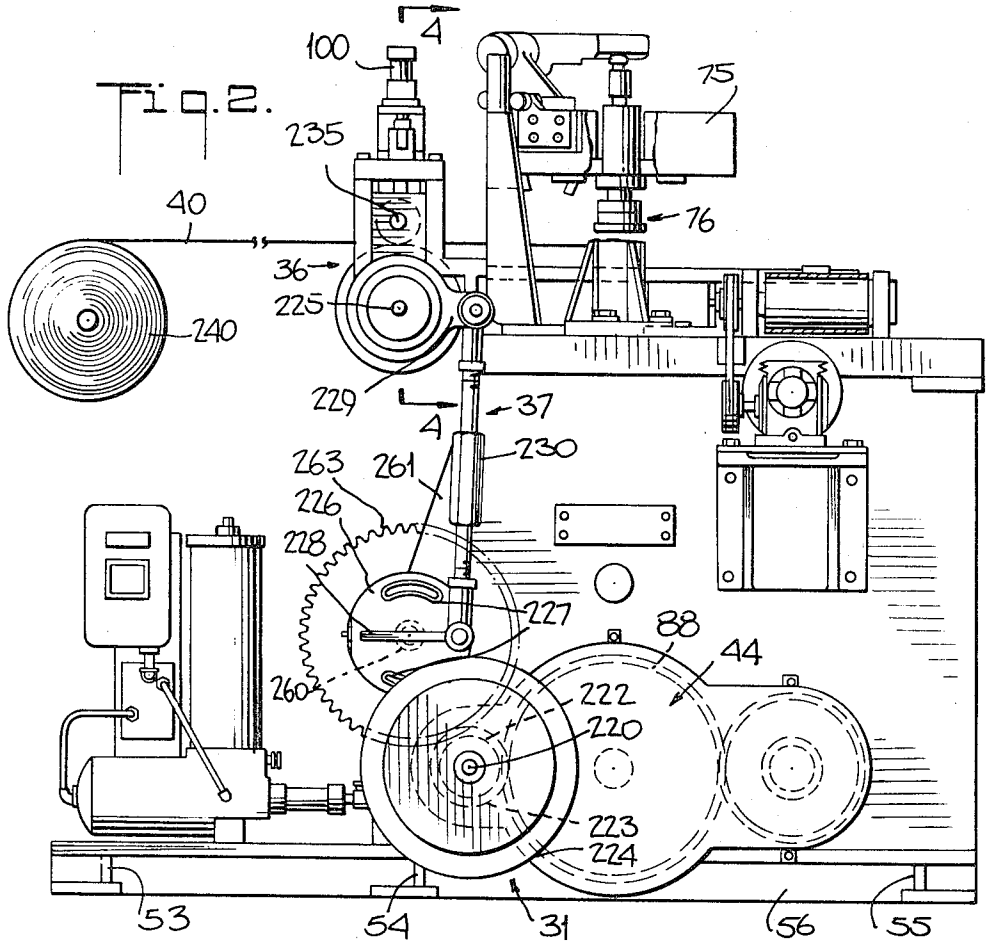
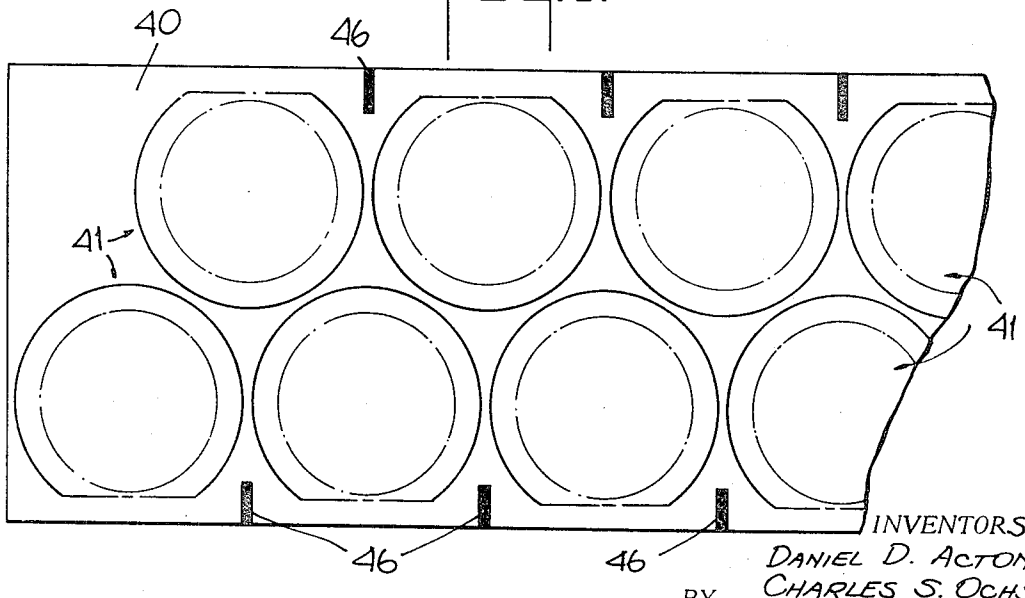


Fig. 7.



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REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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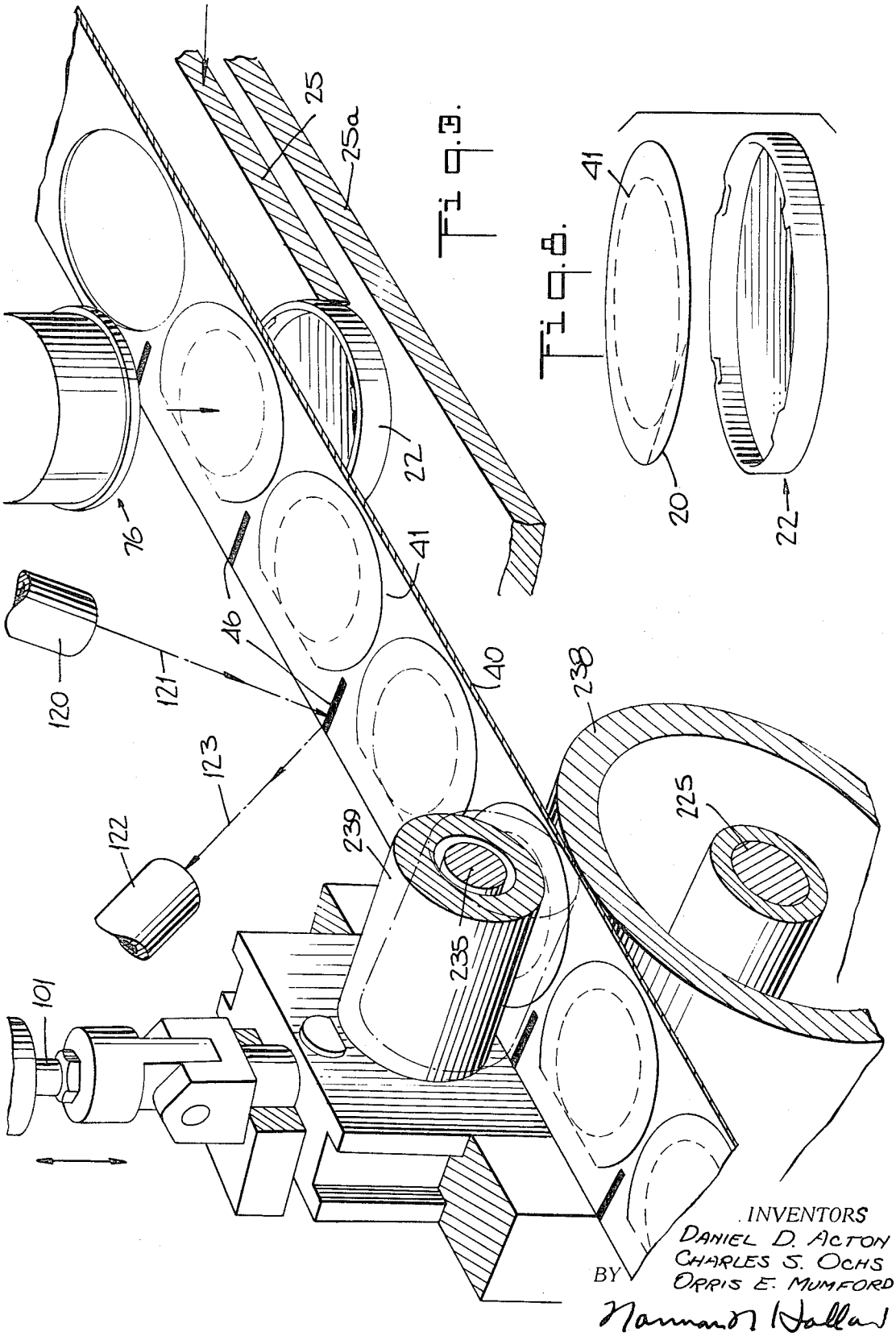


Fig. 3.

Fig. 4.

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REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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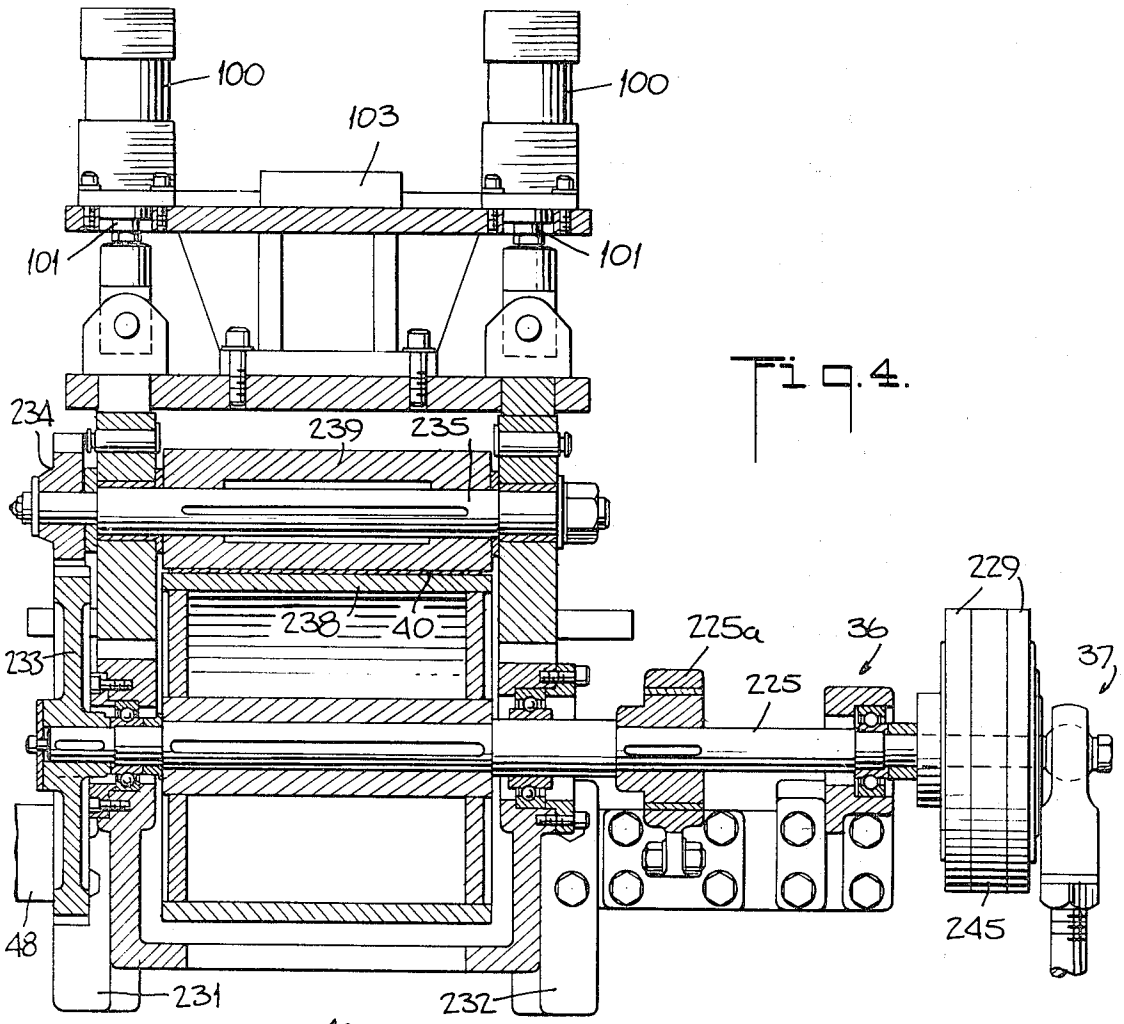


Fig. 4.

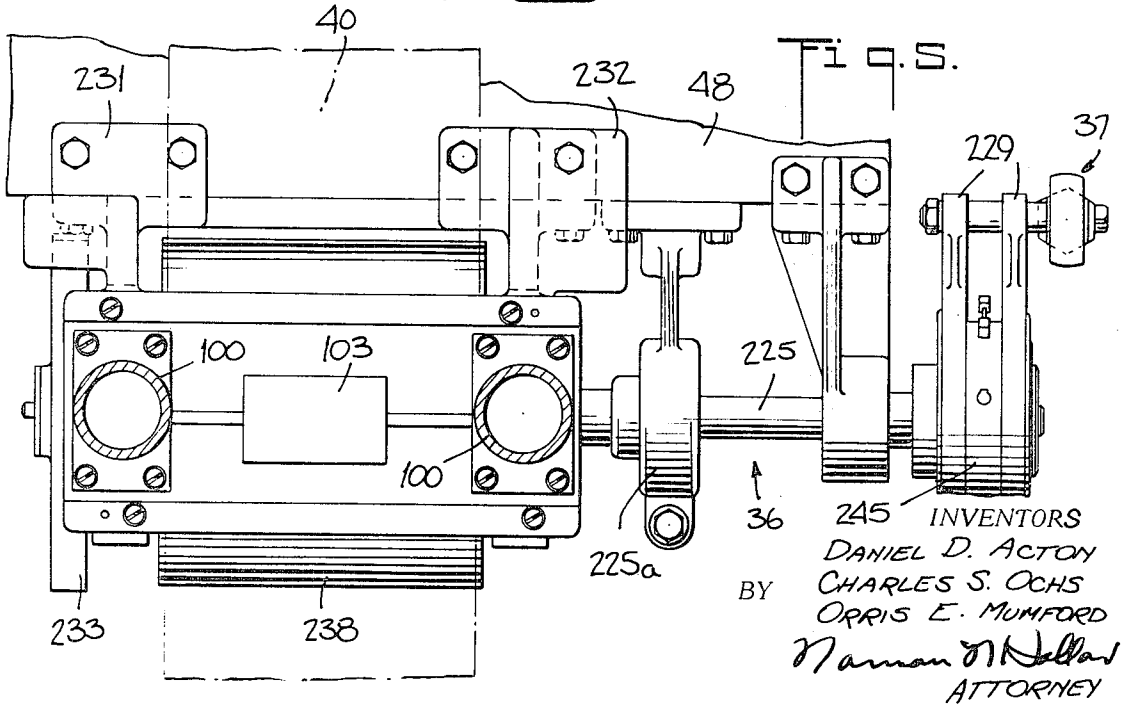


Fig. 5.

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REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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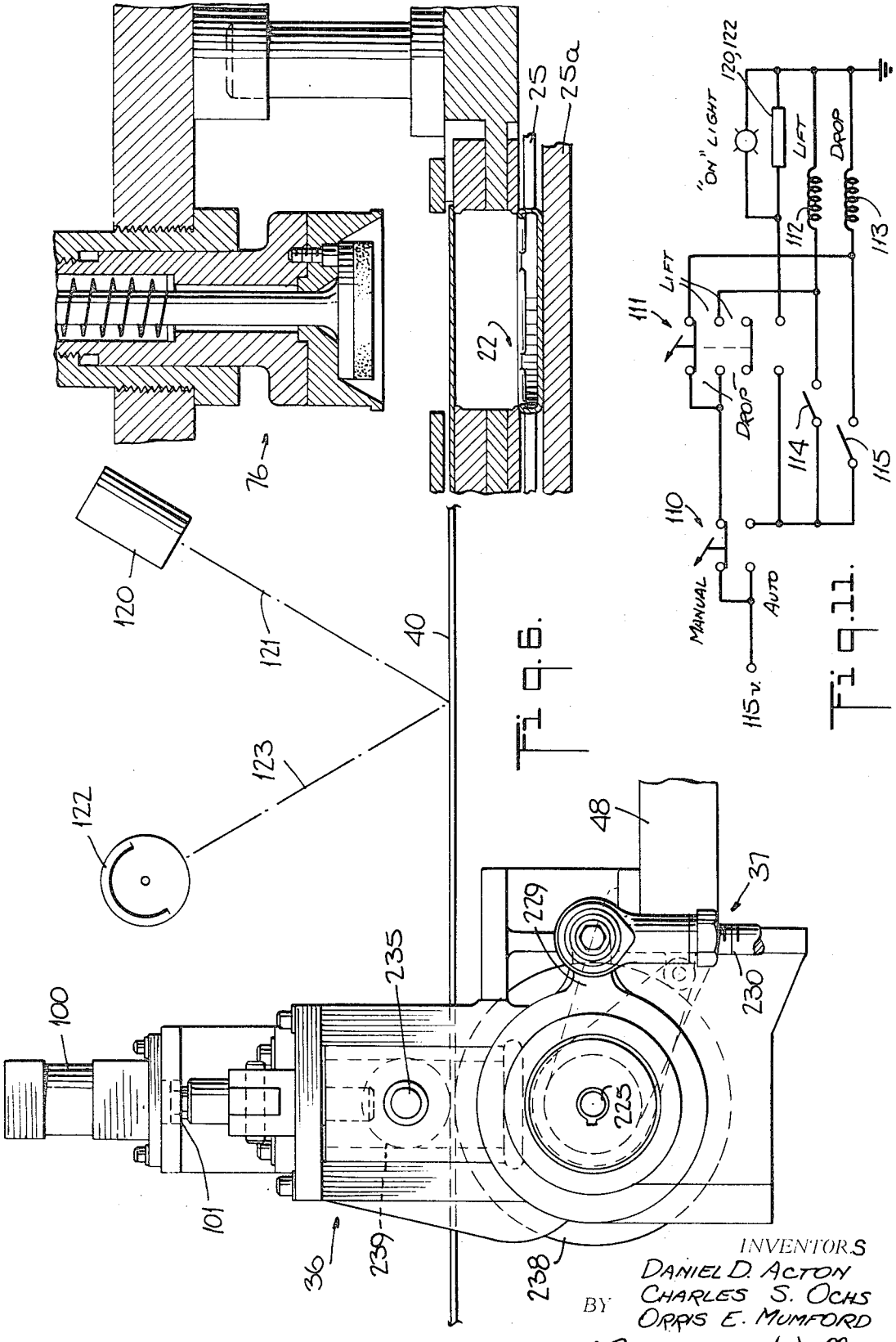


Fig. 6.

Fig. 11.

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3,546,768

REGISTRATION SYSTEM FOR PAPER LINING MACHINE

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Int. Cl. B23q 17/00
U.S. Cl. 29—407 4 Claims

ABSTRACT OF THE DISCLOSURE

A method and machine for inserting printed liners in proper registration in articles such as closure caps wherein the liner feeding mechanism is indexed by means of a photo sensitive system in response to indicia marked on the liner material. The feed mechanism includes an intermittently-operated drive roller and a pinch roller which is raised and lowered by hydraulic means in response to the sensing means. Spaced indicia are provided near the edge of the liner material to be detected by the photo sensing means which provides a signal which causes the pinch roller to be raised to stop the advance of the liner material at the exact point where the printed liner and cap interior are in register. A switch actuated by the continually operating main drive system provides a signal which returns the pinch roller to the drive position for the next feed cycle.

CROSS REFERENCES

The present invention is an improvement upon closure lining machines of the type disclosed in co-pending application Ser. No. 580,712 filed Sept. 20, 1966 and owned by the assignee of the present invention.

BACKGROUND OF THE INVENTION

The present invention relates to machines for inserting liners in closure caps and more particularly to a method and means for cutting out and inserting liners from a sheet having printed matter thereon which must be properly registered with the interior of the closure cap.

Machines for inserting liners of paperboard, wax paper and other suitable materials in closure caps are in common use in the packaging industry. Generally, these liners are punched from a sheet of the liner material as the material is passed over the inverted closure caps. The caps are fed along a conveyor to an indexed station beneath the liner material and a stamping device above the material sequentially cuts out and inserts a liner from the sheet of material into the interior of the cap. To accomplish neat and precise cutting of the liners from the sheet material the feeding of the sheet material is generally stepped or intermittent in accordance with the indexing of the passing closures. A common method of indexing the passage of the closures is the use of a rotating star wheel. The star wheel receives one or more closures at a time in a pocket from the conveyor and is indexed to pass the closures to a series of stations where one or more liners may be inserted therein.

If there are no markings or printed matter on the liners there is no need to properly index any particular portion of the liner material in registration with the interior of the closures. The mechanism for feeding the sheet of liner material therefore need not be precisely controlled as the amount of material advanced during each intermittent operation may vary somewhat as long as the punched out portions do not overlap. However, when it is desired to have printed matter or other markings on the closure liners it becomes necessary for the stamping apparatus to cut out the particular areas on the

liner sheet material containing this printed matter when inserting the liners in the closures. The present invention is directed to a system for operating the liner sheet feeding mechanism so as to insure proper registration between the printed liner areas and the interiors of the closure caps.

SUMMARY OF THE INVENTION

The method and means of the present invention adapts the presently used feeder mechanism which comprises a large drive roller and a smaller cooperating pinch roller to precisely index the feeding of the liner material to the punch-out station. An improved sensing system is provided which detects suitably spaced indicating marks on the sheet material and causes the pinch roller to be raised ceasing the advance of the material precisely at the point where the printed area of the material is in register with the interior of the closure to be lined.

It is therefore an object of the present invention to provide an improved indexing system for closure cap lining machines permitting much higher liner machine speeds.

It is another object of the present invention to provide an improved system for precisely registering printed liners in the lined caps where each liner cut is independently controlled thereby preventing error accumulation and eliminating error compensation means.

It is another object of the present invention to provide such an improved system which may be readily adaptable for use with existing machinery of this type.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

BRIEF DESCRIPTION OF THE DRAWING

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification wherein:

FIG. 1 is a top view of the liner insertion machine;

FIG. 2 is a side view of the machine;

FIG. 3 is a perspective view showing the liner sheet being fed to the cutting and inserting station and illustrating the indexing system of the present invention;

FIG. 4 is a sectional view in elevation of the liner sheet feeder;

FIG. 5 is a top view of the liner sheet feeder;

FIG. 6 is a side view showing the liner sheet being fed past the indexing sensor system to the cutting and inserting station and showing the liner cutting and inserting mechanism in greater detail;

FIG. 7 shows a preferred embodiment of a liner sheet having indexing marks thereon in accordance with the present invention;

FIG. 8 is a perspective view of a closure cap showing a liner after cutting and prior to insertion;

FIG. 9 is a sectional view of a closure cap prior to the insertion of the liner;

FIG. 10 is a sectional view of a closure cap with the liner in place on the inside of the cover; and

FIG. 11 is a schematic of the circuit which may be used to control the system of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a top view of a preferred embodiment of the liner insertion machine incorporating the present invention wherein liners **20** and **21** are inserted in metal or plastic closures **22** such as those of the type illustrated in FIGS. 9 and 10. The closures may be of any of various conven-

tional designs having a top panel **23** and a depending skirt **24**. The liner **20** may be made of paperboard or other suitable materials commonly used for such purposes.

The machine comprises a star wheel **25** for indexing the motion of the closures during the lining operation; liner sheet feed mechanisms **36** and **38** which provide a supply of liner material **40**; cutting and tamping mechanisms mounted at the stamping stations Band D for punching the liners from the sheet of material; and a suitable drive system for operating these various devices. The entire apparatus may be mounted on a frame **47** comprising a table **48** with sides **49, 50, 51** and **52** and (FIG. 2) a base seating on beams **53, 54** and **55** extending parallel to the main auxiliary drives and beams **56** extending therebetween.

As shown in FIG. 1, the closures **22** are fed on a conveyor to a star wheel **25** and rest on a support plate **25***a*. The star wheel **25** is rotated clockwise as indicated by the arrow and has six slots or pockets **27**. The star wheel **25** is indexed through six positions indicated at A through F by a suitable drive located beneath it. The closures **22** are received from the conveyor **30** at station A and are indexed by the star wheel **25** to the feed station B to receive the liner **20**.

The particular operations performed at stations C and D need not be described for the purposes of our invention but if an additional thin sealing liner **21** of wax paper or plastic or the like is to be used it may be inserted at station D as shown in skeleton form in FIG. 1. At station E the lined closures **22** are ejected on to conveyor **69**. The station F is an intermediate position where no operation is performed.

The apparatus has two separate drive systems comprising the feed conveyor drive mechanism **28** at the lower right hand of the figure and the main drive mechanism **29** at the upper left. The closure feed drive **28** operates conveyor **30** for delivering the closures to station A of the star wheel. The main drive mechanism **29** has a main drive **31** extending to the opposite side of the table **48** and connected to the motor **32** by the belts **33** through pulleys **34** and **35**. The main drive **31** is connected to the first liner feed assembly **36** which supplies liner material to station B through the liner feed intermittent drive **37**. In the event that a second liner feed assembly **38** is used for supplying station D, it is connected to and driven by the intermittent liner feed drive **37***a* on the opposite side of the machine from drive **37**. The liner feed assembly **36** supplies the thicker liner material in sheet form to station B and the liner feed assembly **38** supplies the thinner liner material to station D. These assemblies may be essentially identical in form and both may incorporate the present invention. The liners at stations B and D are cut from the liner material **40** and tamped into closures **22** by suitable stamping mechanisms such as **76** shown in general detail in FIG. 2.

The closures **22** are removed from the slots **27** at station E by the ejection finger **42** operated by the ejection mechanism **43**. The stamping mechanisms **76** are reciprocally actuated by the drive **44** at the lower center of the FIGS. 1 and 2. The ejection mechanism **43** is driven by the auxiliary drive takeoff **45** at the top of FIG. 1 which is connected to the pounder drive **44**.

The size of the slots **27** of the star wheel **25** and the number of heads on the stamping mechanisms **76** may be varied in construction to place liners in from one to five closures at a time, depending upon the size of the closures. In the embodiment shown, two closures at a time are operated on by the machine. A guide rail **60** is provided about one side of the wheel **25** to maintain the closures **22** in the slots **27** during the lining operation.

When it is desired to include printed matter on the closure liners, it is necessary to arrange the printed pattern in such a manner that the pattern will be in register with the interior of the closures during the punching operation. This requires in the present case, as shown in FIG. 7, arranging the successive sets of markings **41** at an angle to the opposite edges of the liner material **40**. A further requirement is that the markings must be presented in register with the closure interiors at the stamping station.

The present invention is directed to a control system for the liner feed mechanism which will insure proper continuous registration between these printed patterns and the interiors of the caps into which they are to be inserted. The improved liner feed assembly to be used in the present invention is shown in and will be described with reference to FIGS. 2, 4 and 5.

THE IMPROVED ROLL FEED ASSEMBLIES

As seen in FIG. 2 the main drive **31** comprises a shaft **220** having gears **222** and **223** on its end and a wheel **224** for manual operation of the machine. The gear **223** meshes with gear **88** of the auxiliary drive **44** which is connected to and operates the stamping mechanisms **76**. Gear **222** operates the liner feed assemblies **36** and **38**.

The first liner feed assembly **36** has a shaft **225** intermittently rotated by the liner feed intermittent drive **37**. The drive **37** comprises a shaft **260** and crank plate **226** coupled to the gear **263** and continuously rotated in one direction. The shaft **260** is rotatably mounted in extension **261** of the front wall **49** and a corresponding extension in the rear wall **51**. The gear **263** of shaft **260** engages gear **222** on the main drive **31** to continuously rotate shaft **260**. Thus, the plate **226** is continuously rotated when the machine is operating.

Plate **226** has arcuate slots **227** and a diametric slot **228** for adjusting the plate **226** and the amplitude of operation imparted to the arm **229** on the shaft **225**. The arm **229** is connected to the plate **226** by means of the adjustable coupling **230**. As seen in FIGS. 4 and 5 the shaft **225** is rotatably mounted in brackets **231, 232** mounted on the side **50** of table **48**. At the opposite end from the arm **229** gear **233** is fixedly keyed to the shaft **225** and meshes with the gear **234** mounted on shaft **235**. A large diameter roller **238** is fixedly keyed to the shaft **225** and a smaller diameter roller **239** is fixedly keyed to the shaft **235**. Thus, the two rollers **238** and **239** are constrained to rotate together through the gears **233** and **234**. These gears will remain in engagement during the lifting of the smaller roller **239**, as will be later described, by constructing the size of the meshing teeth to be greater than the size of the stroke of the smaller roller **239**.

The arm **229** is driven in reciprocal motion up and down by drive **37**. This arm is connected to a ratchet means **245** mounted on the end of shaft **225**. The action of arm **229** then causes intermittent rotation of the shaft **225** and accordingly the large diameter roller **238**. By this motion a continuous sheet of material **40** held between the large and small rollers **238** and **239**, respectively is drawn from a supply **240** (shown in FIG. 2) and intermittently fed to the punching station B for insertion in the closure caps. A brake means **225***a* is provided to limit the rotation of the drive rollers to the arc of actuation.

In the present embodiment the arc of actuation of the large roller is set to be large enough so as to normally cause each set of printed liners on the sheet material to pass somewhat beyond the point of registration with the closure cap to be lined. This will insure that the printed areas on the liner sheet will not fall short of registration with the caps. The improved control system acts to prevent the areas from being advanced beyond the point of registration as will be explained hereinafter.

In the improved roll feed assembly two hydraulic cylinders **100** are mounted on the top of the mechanism as shown in FIGS. 4 and 5 with their piston rods **101** attached to opposite ends of the shaft **235**. Extension and contraction of the rods **101** will thus move the small pinch roller **239** mounted on the shaft **235**, respectively into and out of engagement with the linear material **40**. When the pinch roller **239** is in contact with the liner material **40**,

the material will be advanced by rotation of the large drive roller **238**. However, when the small pinch roller **239** is raised from contact with the material **40** further rotation of the drive roller **238** will fail to advance the material at the stamping station.

Actuation of the two hydraulic cylinders **100** is controlled by a four-way solenoid operated valve **103**. The valve **103** in one position will extend and hold the piston rods **101** in the extended position while movement to the other position will cause retraction and holding of the rods **101** in the retracted position. Actuation of the valve **103** then will alternately drop the pinch roller **239**, which is attached to the piston rods **101**, into engagement with the liner material **40** or lift it out of contact with the material to cease the driving operation.

It will be seen that by means of the system including valve **103**, precise control of the liner feed may be achieved so that the printed areas may be fed into exact registration with the closure caps each time the material is advanced by the drive roller **238**.

REGISTRATION MARKINGS

In order to determine exactly when the printed patterns **41** on the liner material **40** are in register with the interior of the closure caps **22** to be lined, an improved marking system is provided on the material. These marks **46** as shown in FIG. 7 are placed on or adjacent to the edge of the material **40** and are suitably spaced so as to indicate the exact distance which the liner material **40** must be advanced to present the next successive printed pattern **41** exactly above the interior of the closure cap **22**. Thus, by sensing these marks **46** on the material during each intermittent advance the material **40** can be made to move only the distance included between the successive indicating marks **46** and the printed patterns **41** will be stamped out in exact register with the interior of the closure caps **22**.

The present invention includes an improved system for sensing the distance between these marks **46** and controlling the operation of the pinch roller **239** to insure the advancement of only the exact amount of material **40** to cause proper registration.

IMPROVED SENSING SYSTEM

The improved sensing system provided in the preferred embodiment includes a photo sensitive system which is actuated by the markings on the edges of the liner material. Referring to FIG. 3, a source of light **120** casts a beam **121** which strikes the liner material **40** near its edge and is reflected toward a photocell **122** arranged at an appropriate angle to detect the reflected beam **123**. The beam **121** strikes the passing markings **46** on the material **40** and an indicative signal is produced by the photocell **122** each time a mark **46** is intercepted by the light. As previously stated these marks **46** are spaced along the edges of the liner material **40** at points which will cause the printed matter **41** to be placed in register with the closure cap **22** during each advance of the material **40**. When the liner material **40** is advanced the photo sensing means **122** is triggered by the next successive mark **46** on the edge of the material **40** indicating that the printed matter **41** is in registration with a closure cap **22**. This signal will cause the hydraulic cylinder control valve **103** to be actuated to raise the pinch roller **239** from the material **40**, ceasing the advance of the material at the exact point when the printed matter **41** and the closure caps **22** are in register.

An improved circuit for achieving this operation is shown in FIG. 11 and the operation of the entire system will now be described with reference to it.

Referring to FIGS. 3, 6, and 11 the overall operation of the system is as follows. As seen in the circuit diagram, two switches **110** and **111** are provided for controlling the operation and setting of the liner feed machine. When the first switch **110** is in the manual position the second switch **111** may be used to raise and lower the pinch roller **239** by alternately energizing the "lift" and "drop" legs of the circuit. These legs contain solenoids **112** and **113**, respectively, which shift the valve **103** which controls the actuation of the hydraulic cylinders **100**. When it is desired to operate the pinch roller **239** by means of the automatic photo sensing system, the first switch **110** is thrown to the "auto" position and the second switch **111** is put in the "lift" position. The ratchet-operated shaft **225** will intermittently rotate the large drive roller **238** to feed the liner material **40** to the stamping station **76**. The material **40** will only be fed to the station when the pinch roller **239** cooperates with the drive roller **238**, that is, when in its dropped position. As seen in FIG. 7 the liner material **40** is provided with printed markings **41** which must register with the interior of the closure caps **22** at the time of the stamping operation. In order to accomplish this registration, spaced indicator marks **46** are provided on the edge of the material **40**. These marks **46** are sensed by the photo sensitive system comprising the lamp **120** and the photocell **122**. When an indicator mark **46** is detected by the photocell **122**, the signal will cause the relay contacts **114** in the "lift" leg of the circuit to be closed. The closing of these contacts **114** actuates the hydraulic cylinders' control valve **103** to cause retraction of the cylinder rods **101** and accordingly the lifting of the pinch roller **239** from the liner material **40**.

The operating arc of the drive roller **238** is set so that during each advance of the liner material **40** the succeeding printed markings **41** will pass somewhat beyond the point of registration with the interior of the closure caps **22** at the stamping station B. However, the sensing of the indicator marks **46** on the edge of the liner material **40** will cause the pinch roller **239** to be lifted from the material **40** at the moment that the liners **41** are in registration. The advancement of the liner **40** then will stop exactly at the point of registration with the closures **22** although the action of the drive roller **238** will continue for a short period. The stamping mechanism **76** will then cut and insert the registered liners **41** into the closure caps' interiors and be withdrawn.

The continually operating main drive system **31** will cyclically close a timing contact **115** in the "drop" leg of the circuit actuating the solenoid **113** to move the valve **103** to the "drop" position. Thus after each stamping the valve **103** will be actuated to extend the cylinder rods **101** dropping the pinch roller **239** again into the drive position. The liner material **40** will again be advanced until the next indicator mark **46** on the material is detected by the photocell system.

It is seen from the foregoing description that an improved method and means for forming and inserting a plurality of printed liners in closures for containers has been developed. The closures may be of various types, such as threaded, lug, etc., and may be made of glass, plastic, metal or any other suitable container material. The machine in its operation provides a rapid and positive presentation of the liner material to a liner receiving station, and a positive cutting, seating and registering of the liners in the closures so that each closure has the liner properly formed and positioned. Thus the closures are rapidly and accurately provided with a plurality of printed liners, in proper registration, which reduces the cost of manufacture and increases the rate of production of closures with this type liner.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. In a machine for inserting printed liners in proper registration in closure caps having rotary means for feeding a closure cap to a station, means for feeding printed

liner material to a station and punch means for cutting a liner from the material and inserting the liner in the closure wherein the feeding means includes an intermittently operated drive roller and a pinch roller for pinching and advancing the liner material, the improvement which comprises means for moving said pinch roller into pinching relation responsive to movement of the pinch means to advance said liner material, and sensing means responsive to the passage of indicia on said liner material for moving said pinch roller out of pinching relation to abruptly terminate the liner material advance.

2. A machine as claimed in claim 1 wherein the sensing means is a light sensitive means.

3. A machine as claimed in claim 1 wherein the means for moving the pinch roller includes a hydraulic cylinder.

4. A machine as claimed in claim 1 wherein said intermittently operated drive roller is set to feed the liner material beyond the point of registration with the associated closure during each advance.

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U.S. Cl. X.R.

83—371; 113—80, 114