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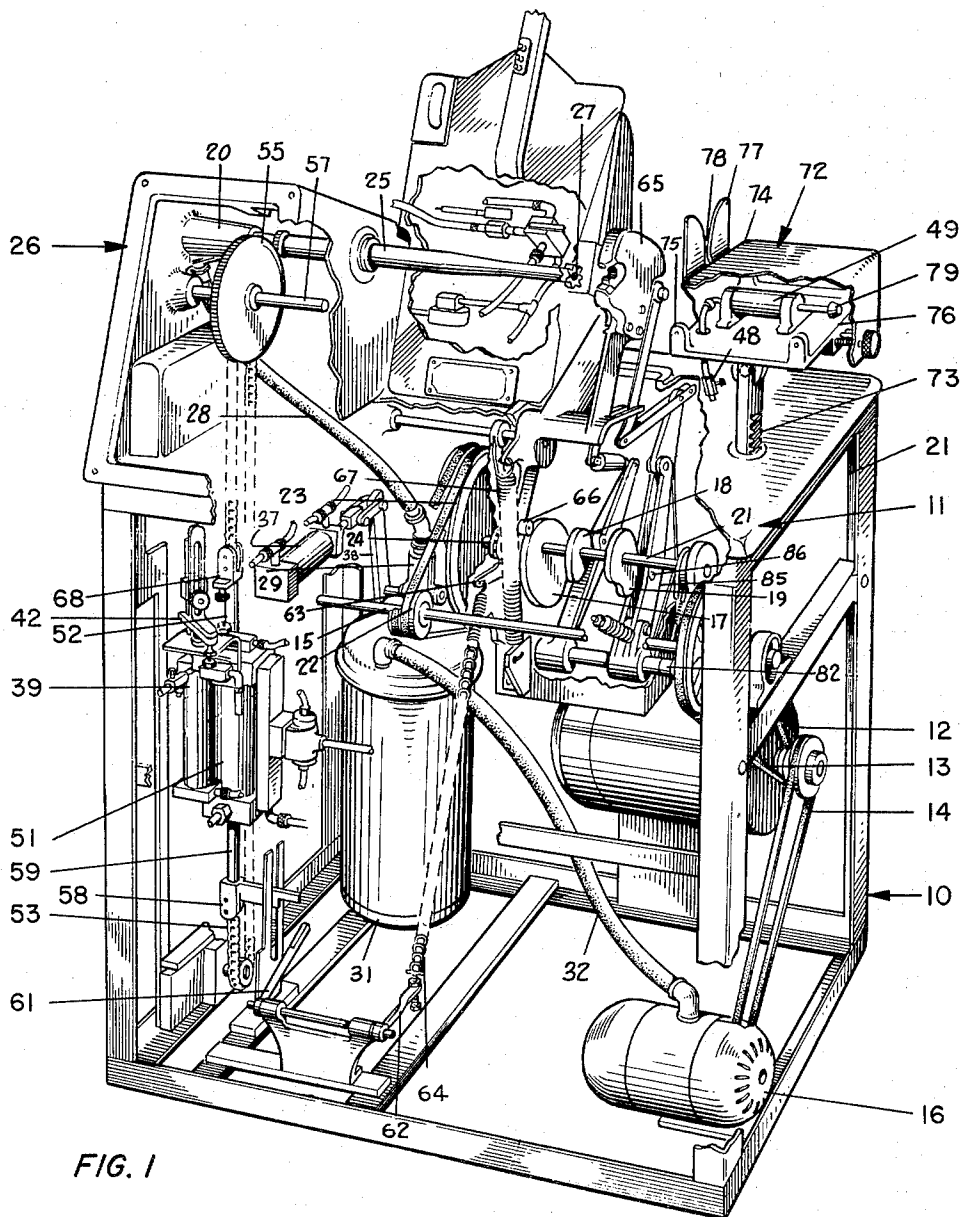
G. W. PEARCE ET AL

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AIR OPERATED PACKAGE SEALING MACHINE

Filed July 9, 1956

3 Sheets-Sheet 1



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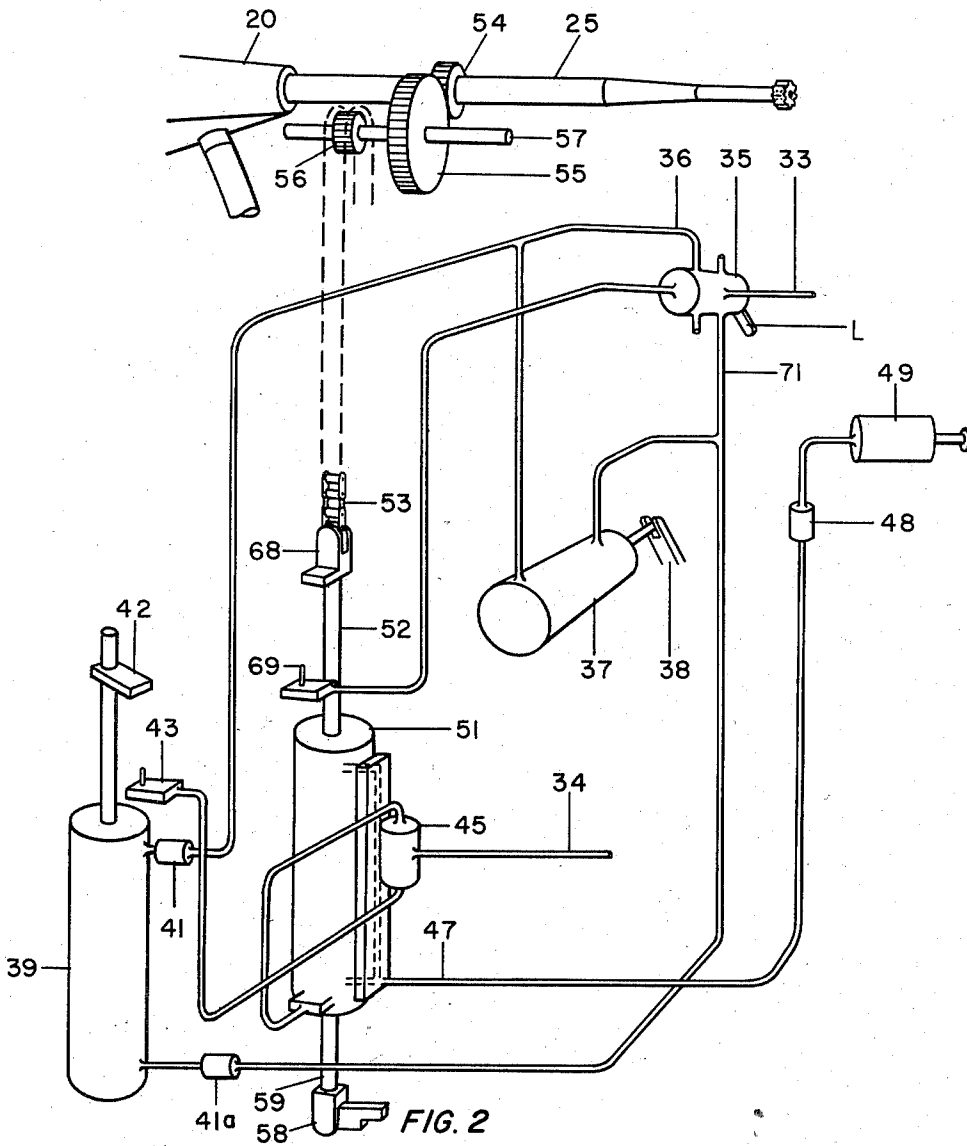
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AIR OPERATED PACKAGE SEALING MACHINE

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Application July 9, 1956, Serial No. 596,483

3 Claims. (Cl. 53—112)

This invention relates to improvements in food processing machinery and particularly to an improvement of the machine described in U. S. Patent No. 2,733,564 to Russell et al., dated February 7, 1956. The controls of that machine were all electric. Its various functions were controlled by the sequential energizing of circuits associated with the operation of solenoids.

For many products, electric control and operation of the machine result in simple maintenance and troublefree service, but in the case of a packaging plant putting up meats where the sterilization practices of the establishment include flooding the apparatus with hot sterilizing solutions and often blasting all surfaces with jets of live steam, the water, soap, melted fat and sterilizing salts frequently flood or short out the electrical gear.

The objects of the present invention are: to produce a machine which will not be put out of order by the most rigorous sterilization practices, to secure dependable rotation of the neck twisting spindle even when the machine is wet or greasy, to apply tension to the neck during twisting in a controllable but automatic manner, and to provide means to close securely a wide range of neck clip sizes.

The machine performs the following functions:

A. It removes air from a package of foodstuff which has been placed in a bag formed of flexible, impermeable, and preferably transparent wrapping material.

B. After the air has been pumped from the bag, it twists the neck of the bag tightly to form an hermetic seal.

C. It applies a metal clip around the twisted neck.

D. It squeezes the clip about the neck to maintain the hermetic seal.

E. It trims off the excess neck of the bag which flares out beyond the crimped metal clip.

These operations are performed in timed, automatic sequence at rates averaging 12 packages a minute for a 1-pound package of frankfurters.

In the drawings,

Figure 1 is a front elevation of the machine. Enclosing panels have been removed and parts of the table and integral head-stock have been broken away to expose the working parts.

Figure 2 is a schematic representation of the pneumatic operating mechanism.

Figure 3 is an elevation of the clip closing levers and cam.

The machine comprises the table frame 10, work table 11 and headstock 26 formed integrally with the work table.

Power is supplied by the totally enclosed motor 12 and transmitted by V belts 13 and 14 to the counter-shaft 15 and vacuum pump 16.

The reciprocating motions of the head, the crimping of the clip, and cut-off of the surplus portion of the bag neck are controlled by cams 17, 18, and 19 fastened to cam shaft 21.

Power is transmitted to cam shaft 21 by belts which

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pass over counter shaft pulley 22 and cam shaft flywheel pulley 23. When the machine operates, pulley 23 turns continuously, cam shaft 21 turns only when single turn clutch 24 is engaged.

Vacuum spindle 25 is journaled in headstock 26. A series of radial bores through its wall connects the longitudinal bore 27 of the spindle with a circumferential vacuum chest—formed inside of the bearing boss 20. Vacuum hose 28 is connected to a port leading into the chest. In this way air drawn through the spindle 25 passes through hose 28, vacuum valve 29, trap and vacuum chamber 31, hose 32, and is exhausted by pump 16.

The distinctive feature of the present machine is the combination of air valves and cylinders which not only control the timing, the tension on the twist, but also turn the vacuum spindle through the proper number of revolutions.

That system is best explained by reference to the diagrammatic representation of Fig. 2.

Compressed air is supplied to conduits 33 and 34. In the starting position, air from conduit 34 passes into conduit 47 and forces the piston in cylinder 49 outwardly (to the right in Fig. 2). This function will be explained later. When the lever L of valve 35 is moved to start the motions, air passes into conduit 36. The piston in cylinder 37 immediately moves and opens vacuum valve 29 by moving valve lever 38. At the same time, timing cylinder 39 starts its downward stroke since it too is supplied with air through conduit 36. Flow control valves 41 and 41a at each end of the cylinder adjust the speed at which the piston travels from top to bottom to about five seconds. This time is sufficient to allow pump 16 to evacuate the largest packages the machine can handle. Adjustable stop block 42, marked with a time scale, may be set as desired for any intermediate period, to save time when small packages are handled. At the bottom of its stroke, block 42 opens poppet valve 43.

The opening of poppet valve 43 throws a 4-way slide valve 45 into its reverse position admitting air above the piston in double ended twisting cylinder 51 and opening line 47 to the atmosphere. Consequently, piston rod 52 and roller chain 53 are pulled downwards. As the chain moves downwards, it spins spindle 25 through the gear train comprising pinion 54, and the pinion gear 55 and chain sprocket 56 which are fixed to countershaft 57.

When the piston of cylinder 51 reaches the bottom of its stroke, trip arm 58 carried on the lower end of piston rod 59 engages crank lever 61 (Fig. 1). This pulls down crank arm 62 and trips the stop pin lever 63 of the single turn clutch 24 by pulling the chain connection 64. Cam shaft 21 now revolves and the head 65, riding on cam roller 66 as the position of cam 17 determines, is pulled into its forward position by spring 67.

With the exception of the crimping lever, riding on cam 19, the head, levers, clutch, and cams operate as described in the Russell et al, patent (supra) and will not be further described.

When cylinder 51 reaches the bottom of its downward piston stroke, block 68 engages poppet valve 69. The opening of valve 69 reverses valve 35, returning lever L to its original position, opening conduit 36 to the atmosphere and diverting the air pressure into conduit 71. The pistons in cylinders 39 and 37 then reverse their movement. Cylinder 37 shuts vacuum valve 29. Simultaneously, air is admitted to the bottom of cylinder 39. Its piston and rod move upwardly releasing poppet valve 43. This reverses the action of valve 45, admitting air through conduit 47 and raises the piston of cylinder 51. As trip arm 58 disengages lever 61, the pin of clutch 24 is released.

The function of cylinder 49 has so far been omitted. Referring to Fig. 1, it will be noticed that the product

table 72 is supported by a rack 73 which raises or lowers the table to adjust it to the size of the package. (When properly adjusted, the center line of the package is directly in line with the spindle 25.) The top 74 of the product table 72 is an open box riding on four rollers 75—set at the four corners of the support plate 76. A shield or barrier 77 is attached to the inboard edge of top 74. Barrier 77 is formed with a deep V slot 78. Piston 79 of cylinder 49 rests against the outer edge of product table 72.

The product in its flexible bag is placed on the product table. Its open neck is laid in the slot, passed over and gathered about spindle 25.

In any twisting procedure, the strand shortens as the twist progresses and, unless the strand is maintained under tension, the twist which is formed is neither uniform nor tight. A tight and slightly stretched twist is essential in forming an hermetic seal. In the previous machine, tension was applied by the operator who pushed back on the package with the right hand as the product was drawn across the product table towards the spindle as the twist shortened the neck strand. Forgetfulness or inattention could product a poorly sealed package. In the present machine, the product cannot slide, but is held by the barrier 77. Proper tension is secured by the adjustment of flow control valve 48 which causes the cylinder 49 to act as a dash-pot and yieldingly resist the movement of top 74 as it is pulled to the left (Fig. 1). Thus, proper neck tension is secured in all cases.

The machine is adapted to package a wide range of products, for example, a package of six frankfurters or a chicken, and consequently must be adapted to close hermetically an equally large range of bag sizes. In closing, a clip around a flexible and somewhat compressible twisted neck to form a hermetic seal, the correct amount of compressive force must be used. If the force is insufficient, the clip may be mechanically closed, but the neck will remain so loose that leakage will occur between the layers of film. If the force is too great, the clip will cut into the material of the neck. Then air will leak into the evacuated package. The average diameter of the twisted neck of the bag determines the size of clip which must be used, and this plus the characteristics of the material from which the bag is made determine the amount of pressure which can be applied without damage to the hermetic seal.

The crushing force which may be exerted by the clip closing jaws in the head is made adjustable to demands in the following manner. The jaw cam lever 81 (Figure 3), which is journaled on lever shaft 82, is made in two parts: jaw operating lever 83 and jaw operating arm 84. Lever 83 is bifurcated and houses cam roller 85, which is journaled on pin 86 between its two arms. Pin 87 holds jaw operating arm 84 in position by passing through it and through the two arms of lever 83. The T head 88 of bolt 89 is seated in slot 91 formed in arm 84 adjacent its lower extremity and passes through 84. A particular spring 92 with the correct compression rate for a particular clip is supplied and retained by the nuts 93. When at rest, the spring holds the arm 84 against lever 83, but when the cam 19 revolves, arm 84 floats against the pull of spring 92. Overpressure in closing the clip is eliminated.

The difference between the open and closed coil length of spring 92 is made greater than the throw of cam 19 so that should a clip misfeed and jam in the head, spring 92 may compress sufficiently to allow cam 19 to complete

its revolution without imposing destructive strains on any part of the apparatus.

A spring of the correct degree of stiffness to secure effective closing and made distinctive by plating or other metal finish is supplied for each size of clip which may be used. They may be quickly changed merely by backing off the nuts 93 and replacing the spring with the one having proper stiffness. This change is so easy and obvious that misadjustment of closing pressure in the field is most unusual.

The entire machine is effectively water and steam proof. The air cylinders and air valves remain completely indifferent to the most drastic cleaning procedures and exceptionally dependable operation in the field has been secured.

We claim:

1. In a vacuum packaging machine adapted to form twisted neck bag closures, a rotatable vacuum spindle, a vacuum conduit leading to said spindle, a valve in said conduit, timing means including an air cylinder having an adjustable, time determining stroke, means including an air cylinder to operate the vacuum valve, lines to supply compressed air to both of said cylinders, manual valve means in the supply to initiate the admission of air into both of said cylinders, the vacuum valve operating cylinder being arranged to open the valve at the beginning of the stroke of the timing means, a third cylinder associated with means arranged to rotate the spindle, means arranged to admit air to said third cylinder when the timing cylinder has completed its stroke, and valve means cooperating with the piston of said third cylinder to restore the system to its original operating position upon the completion of the twisting stroke of the cylinder.

2. In a vacuum packaging machine having a vacuum nozzle adapted to evacuate a flexible, impervious package, a vacuum conduit connecting said nozzle with a vacuum pump, a valve in said conduit, means to determine the time during which the package shall be evacuated including an air cylinder having adjustable air input and escape rates, an air cylinder arranged to operate the vacuum valve, means controllable by the operator to admit air to both cylinders simultaneously and means associated with the timing cylinder and operative at the completion of its timing stroke to reverse the action of the valve cylinder and close the vacuum valve.

3. In a vacuum packaging machine having a rotatable vacuum spindle and a product table having a notched barrier and adapted to move toward and away from said spindle, a pneumatic cylinder having a piston and piston rod arranged to push the table away from said spindle when said cylinder is energized and means to release air from beneath the piston at a predetermined rate and operative when a package has been sufficiently evacuated, whereby the table may be dragged towards the spindle by the engagement of a package with the barrier as the neck of the package shortens in twisting.

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