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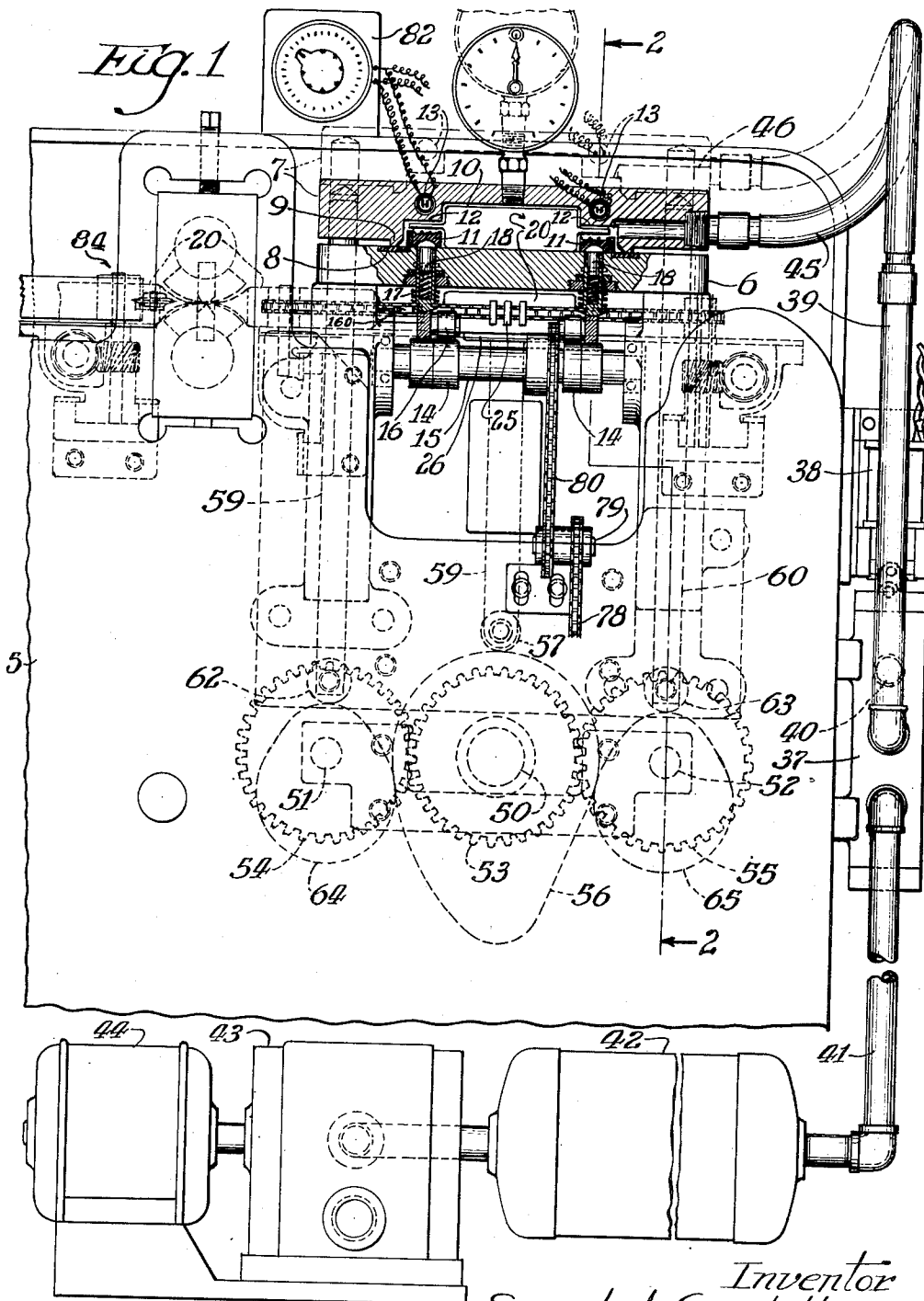
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VACUUM SEALING MACHINE AND METHOD

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2 Sheets-Sheet 1



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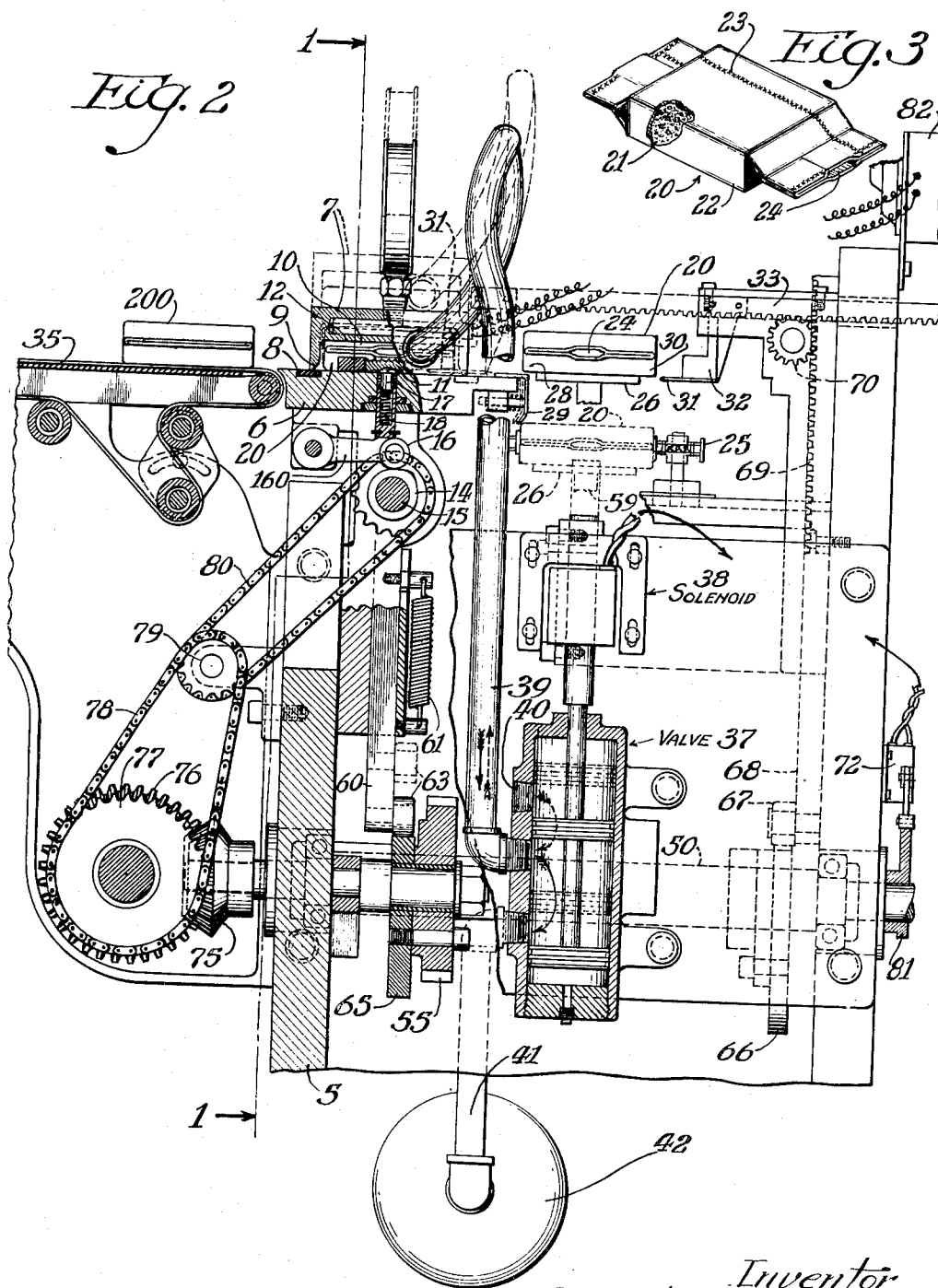
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VACUUM SEALING MACHINE AND METHOD

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8 Claims. (Cl. 53—6)

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This invention relates to a vacuum sealing machine and method.

According to the invention a previously wrapped but still open package is subjected momentarily to high vacuum and the sealing thereof completed by heat or pressure, or both, during the brief interval while such vacuum is maintained. The product packaged will have been wrapped manually or mechanically in an impervious wrapping web which completely envelops and seals the product except for at least one opening, as at one of the wrapper ends. With the product thus wrapped and disposed upon a receiving table, a closure descends over the product into sealed engagement with the table. A vacuum tank of very large capacity, as compared with that of the space in which the package is enclosed, is placed in communication with such space to abruptly evacuate substantially all of the air from such space and from the package. Either the table member or the closure member has a heated die surface against which a complementary die is moved while the enclosure remains under vacuum, thus completing the sealing of the package to prevent access of air thereto when air pressure is restored and the package is released from the chamber.

A vacuum packaging apparatus of this general type has heretofore been incapable of practical use because of the time required to draw an appropriate degree of vacuum sufficient to effect the substantially complete evacuation of the package. In the device herein disclosed, the operation is extremely rapid and therefore of commercial practicability due, in part, to the fact that instead of having the vacuum pump draw directly from the package sealing enclosure, I use a vacuum tank many times greater in capacity than the closure and with relatively short communicating pipes placing it in valve controlled communication with the sealing chamber. The vacuum pump is acting continuously to withdraw air from the tank and the capacity of the tank is so large that the amount of air admitted from the chamber each time the valve opens does not appreciably affect the continued maintenance of high vacuum in such tank. Thus the reduction of pressure in the sealing chamber is virtually instantaneous and the load on the vacuum pump is substantially constant.

As a further means of expediting the action of a vacuum package sealer of this type, I employ an intermittently operable feeder for delivering successive wrapped packages into the vacuum apparatus for sealing, such feeder being positive

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in its operation and adapted to eject from the sealing apparatus packages which have already been evacuated and sealed. In a preferred embodiment illustrated, the wrapped but unsealed packages are lifted by an elevating ram to the level of the vacuum sealed table and are supported by such table and another ram for movement on to the table while the first ram is being retracted. Particularly the horizontally acting ram has to be of special construction to provide not only support but positive propulsion for the packages, this being a further feature of the invention.

In the drawings:

Fig. 1 is a view taken in section on the line 1—1 of Fig. 2.

Fig. 2 is a view taken in section on the line 2—2 of Fig. 1.

Fig. 3 is a view in perspective of a presently wrapped but unsealed package of the type upon which the device operates.

The machine frame 5 supports a work receiver 6 with respect to which the closure member 7 is vertically reciprocable between the full line and dotted line positions in which it is illustrated both in Fig. 1 and Fig. 2. Means is provided for sealing the points of contact between closure 7 and table 6 when the latter is in its full line position. Such means may comprise a gasket 8 in-laid in the table and a rib 9 carried by the closure 7 to seat upon the gasket.

Within the resulting chamber 10, formed between the work receiver 6 and the closure 7, there are sealing dies 11 vertically reciprocable to act upon the complementary die surfaces 12. In practice the dies 11 may, in their retracted positions, lie on the surface of the work receiving table 6 and the surfaces 12 may be formed on the closure member 7. One or both of the dies is heated. By way of exemplification I have shown an electrical resistance element at 13 over each of the die surfaces 12. The heating elements are energized by transformer 82. The dies 11 are moved toward die surfaces 12 by means of the cams 14 on cam shaft 15 and cam followers 16 which rest on the cams 14 to operate the cam follower levers 160 which, in turn, operate the push rods 17 extending through the table 6 into supporting engagement with the dies 11. Each of the push rods is desirably telescopically yieldable subject to the pressure of a contained spring 18 to predetermine the degree of clamping pressure which is exerted by dies 11 upon the work.

The workpiece 20 comprises any article to be

vacuum packaged, such article being exposed at 21 in Fig. 3 by breaking away the wrapper 22. In order that the vacuum packaging may be effective, the wrapper must comprise a web impervious to air and it must be capable of being sealed. Its lapping margins at 23 will already have been sealed but the ends of the wrapper will be open as indicated at 24 in Figs. 2 and 3.

The workpieces, comprising articles thus preliminarily wrapped arrive into the machine in any desired manner, as by the conveyor 25 from the wrapper 84 shown in Fig. 1. Successive workpieces are deposited by this conveyor upon the elevating ram 26 which, when vertically actuated, raises successive workpieces to the level of the work receiving table 6, as shown in dotted lines in Fig. 2. At this level, each successive workpiece has its corner edge 28 immediately adjacent to the infeed apron 29 which projects laterally from the edge of the table. Adjacent the opposite corner 30 of the elevated workpiece is the horizontally projecting finger 31 of the infeed ram 32 which is carried by rack 33 for movement between the full line retracted position in which the rack is shown in Fig. 2 and the advanced position indicated in dotted lines in that view.

It will be observed in Fig. 2 that the workpiece laterally overhangs the elevating ram 26. The actuating connections hereinafter to be described are so timed that as the infeed ram 32 advances, its fingers 31 engage beneath the workpiece for the support of the workpiece as the elevating ram immediately is retracted. The margin 28 of the workpiece rests above the apron 29 and the margin 30 rests on fingers 31 at the time of retraction of the elevating ram 26. Thereupon, with the elevating ram out of the way, the continued movement of the infeed ram 32 pushes the workpiece on the receiving table 6 of the vacuum sealing device in a position to be enclosed in the chamber 10 when the closure 7 descends. The maximum height of the ram exceeds the level of the table 6 so that the fingers 31 can move over the table as shown in dotted lines in Fig. 2.

The positive thrust of each successive workpiece 20 on to the receiving table 6 results in the partial displacement from such table of previously sealed packages 200. The displacement is sufficient to force each such package on to the apron conveyor 35, the operating upper run of which leads from right to left, as viewed in Fig. 2, so that workpieces once engaged therewith are frictionally withdrawn by the conveyor from the table 6 out of the path upon which the closure 7 descends to complete the vacuum chamber.

The sequence of operations is such that the closure 7 descends as soon as the newly arrived package is in place for sealing, the rate of withdrawal of the sealed package 200 being more rapid than the rate of advance of the newly arriving package 20. Immediately the closure 7 is in place to complete the vacuum chamber 10, the valve 37 is shifted by solenoid 38 so that the vacuum line 39, previously in communication with the atmosphere through port 40, is now placed in communication through a short pipe 41 with a relatively very large vacuum tank 42 from which air is continuously being withdrawn by the vacuum pump 43 driven by motor 44 and diagrammatically illustrated in Fig. 1. Desirably the pipe at 41 and the vacuum line 39 (the latter communicating through vacuum hose 45 and passage 46 in closure 7 with the interior chamber 10) are relatively short and of relatively large diameter. Moreover, as noted above, the capacity of tank 42 exceeds

many-fold the capacity of the chamber 10. In practice I have used a tank which is 150 times as large in capacity as chamber 10. Consequently, the abrupt opening of valve 37 results in substantially immediate and substantially complete evacuation of chamber 10 to the precise degree of vacuum maintained in the tank 42, and the amount of air moved through the valve to evacuate chamber 10 is so small in respect to the capacity of such chamber that a vacuum gauge on the chamber shows substantially no fluctuation. This is desirable in order that the load on the vacuum pump 43 and motor 44 may be substantially constant for efficient operation. In practice, the vacuum I have used has been 29 inches of mercury. These facts are obviously stated by way of example and not by way of limitation.

As soon as the chamber 10 is evacuated, the sealing dies 11 are operated as above described, their upward thrust being momentary as will be apparent from the form of the cam 14 as shown in Fig. 2. The retraction of the sealing die 11 is followed immediately by relief of the vacuum in chamber 10 due to the movement of valve 37 to break communication between the vacuum line 39 and pipe 31 and to restore communication of line 39 with the relief port 40, communicating with the atmosphere. Instantly, upon restoration of atmospheric pressure in chamber 10, the closure 7 is raised and the ram 32 will advance to propel a previously elevated unsealed workpiece into position on the work receiver 6, pushing the previously sealed workpiece 200 on to conveyor 35, which will rapidly withdraw it.

It will be apparent that a machine of the present invention can operate with high frequency to seal and discharge successive workpieces. While the invention resides in the structure which makes rapid movement possible, rather than in the details by which such movement is effected, I have shown a practical operating mechanism for the timed sequence of movements above described.

It will be observed in Fig. 1 that there are mounted on the frame 5 a drive shaft 50 and driven shafts 51 and 52. At opposite sides thereof the gears 53, 54, 55 carried by the drive shaft and driven shafts respectively, communicate motion to the driven shafts.

The cam 56, mounted on shaft 50, acts on cam follower roller 57 carried by push rod 59 to actuate the elevating ram 26. The closure 7 which coacts with the work receiver 6 to provide the evacuating chamber 10 is carried by the vertically reciprocable bars 59, 60, which are urged downwardly by the spring 61 (Fig. 2) and carry cam follower rollers 62, 63 acted upon by the duplicate cams 64, 65 mounted on shafts 51 and 52 respectively.

The shaft 50 also carries a cam 66 which, as shown in Fig. 2, operates a cam follower roller 67 carried by the push rod 68 to operate a rack 69. This rack, moving vertically in mesh with the pinion 70, transmits through such pinion horizontal movement to the rack 33 for operating the infeed ram 32, as above described.

The solenoid 38 is controlled by a micro-switch 72 so located as to be operated by cam 81 (Fig. 2).

At its outer end, the shaft 50 carries a bevel pinion 75 meshing with a bevel gear 76 to which is attached a sprocket 77 for chain 78 which drives jack shaft 79. This shaft is connected in turn by chain 80 with cam shaft 15, on which the cams 14 for the sealing dies 11, are mounted.

I claim:

1. In a device for sealing under vacuum packages comprising goods with wrappers applied thereto but not sealed, the combination of a receiver for such packages and a closure therefor, the receiver and closure being mounted for relative movement and together providing a chamber only slightly exceeding in capacity the size of the wrapped package, a vacuum tank of such large capacity with reference to that of the chamber as not to show substantial pressure variation when connected with the chamber, connecting means from the chamber to the tank and to the atmosphere, valve means controlling said connecting means for effecting communication of the chamber alternatively with the tank and with the atmosphere, a vacuum pump connected directly with said tank for evacuating air therefrom under substantially constant load, the said connecting means affording substantially unrestricted communication between the chamber and tank when said valve means is open therefor, whereby the evacuation of said chamber and wrapper is substantially instantaneous and all the air withdrawn from the chamber passes through the tank en route to the pump, means confined within said chamber providing relatively movable sealing surfaces engageable oppositely with portions of the wrapper of a package in said chamber for the sealing thereof, mechanism for the timed operation of said valve means and sealing surfaces sequentially, said sealing surfaces being effective to seal the package substantially instantly following evacuation of the air from its wrapper, motion transmitting connections from said mechanism for effecting relative separating movement between the closure and receiver for releasing the sealed package, said receiver constituting a table and said closure constituting a hollow cover, the table having a work receiving surface fully exposed upon the raising of said cover, in further combination with a work discharging conveyor operating from the immediate proximity of said surface upon articles discharged from said surface onto the conveyor, and a ram reciprocable transversely to and from said table surface for delivering thereto successive wrapped but unsealed packages, the stroke of the ram being such as to position each package on the table in a position to be enclosed in the hollow of the cover and to eject from the table surface onto the discharge conveyor a previously sealed package.

2. The device of claim 1 in further combination with a package elevating ram operating in timed sequence with said first ram in immediate proximity to the table at the side thereof opposite said discharge conveyor and across the path of movement on which said first ram operates to propel successive elevated packages as aforesaid.

3. The device of claim 2 in which the first ram has a working face and horizontally projecting finger means therebeneath, the said rams being provided with synchronized actuating connections for advancing the first ram sufficiently to engage said finger means beneath a package elevated by the second ram prior to retraction of the second ram, said connections being adapted for the substantially immediate retraction of the second ram from the path of the finger means and the first ram.

4. A device for evacuating the air from the wrappers of packages in which such wrappers envelop the contents and having projecting flat-

tened tubular ends unsealed, said device comprising a table having a surface for receiving successive packages with the wrapper ends projecting oppositely across said surface, a hollow closure engageable with the table over each package, said table being provided with means against which the closure detachably seals, said closure being provided above the projecting wrapper ends with a sealing die-surface, a complementary die mounted on the table in opposition to each die surface of the closure for forcing against said closure die surface the intervening flattened tubular wrapper end, means for effecting relative movement between the table and closure for providing a closed chamber about the said package, means for evacuating the air from said chamber upon the engagement of said closure and table, and means for actuating said complementary dies toward said die surfaces for the sealing of said wrapper ends upon the evacuation of said chamber.

5. The device of claim 4 in further combination with means for heating the wrapper ends during engagement of the dies therewith.

6. The device of claim 5 in further combination with a vacuum tank and a substantially unrestricted valve-controlled connection from said chamber to said tank, the capacity of the tank being so large with respect to that of the chamber as to effect evacuation of the chamber substantially instantly upon the opening of the valve without materially reducing the pressure in said tank, and mechanism for sequentially opening the valve and operating said dies.

7. The device of claim 6 in which said mechanism further comprises means for the immediate retraction of said dies following the heat sealing of said wrapper ends and means for the immediate relief of vacuum in said chamber and the immediate subsequent relative movement of said closure and table in a chamber opening direction for the release of the sealed package immediately following the retraction of said dies.

8. A method of evacuating and heat sealing in a chamber including a work table as one side wall thereof a package comprising a workpiece enveloped in a wrapper enclosing the work piece but unsealed, which method comprises conveying the package across the plane of the table, conveying the package in a transverse direction across the table to said chamber, enclosing the package in said chamber, placing the chamber in substantially unobstructed communication with a vacuum tank of such large capacity respecting the chamber as to substantially instantly evacuate the chamber and the wrapper without materially increasing the pressure in such tank, and sealing the wrapper opening while said vacuum is maintained in the chamber and thereafter relieving the vacuum and opening the chamber for the withdrawal of the package.

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