

July 7, 1964

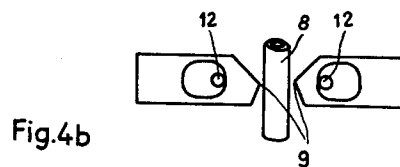
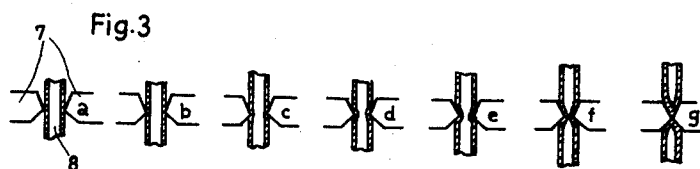
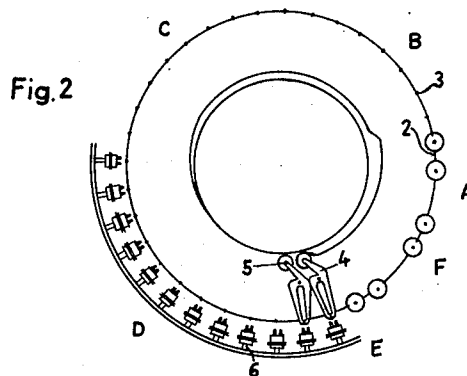
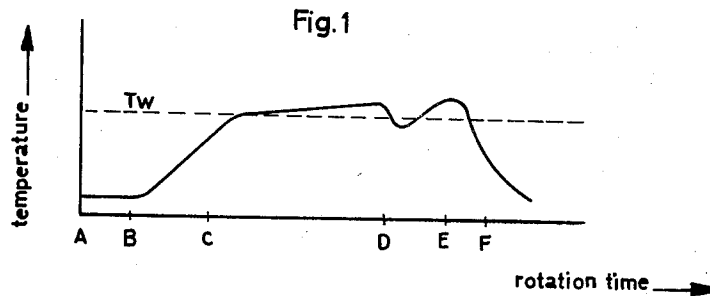
H. WIEDENMANN

3,140,165

APPARATUS FOR TIPPING OFF THE EXHAUST APERTURES OF ENVELOPES
FILLED WITH GAS AT A PRESSURE HIGHER THAN ATMOSPHERIC

Filed Feb. 21, 1961

2 Sheets-Sheet 1



INVENTOR

Hans Wiedenmann

July 7, 1964

H. WIEDENMANN

3,140,165

APPARATUS FOR TIPPING OFF THE EXHAUST APERTURES OF ENVELOPES
FILLED WITH GAS AT A PRESSURE HIGHER THAN ATMOSPHERIC

Filed Feb. 21, 1961

2 Sheets-Sheet 2

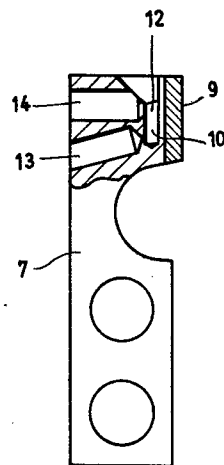
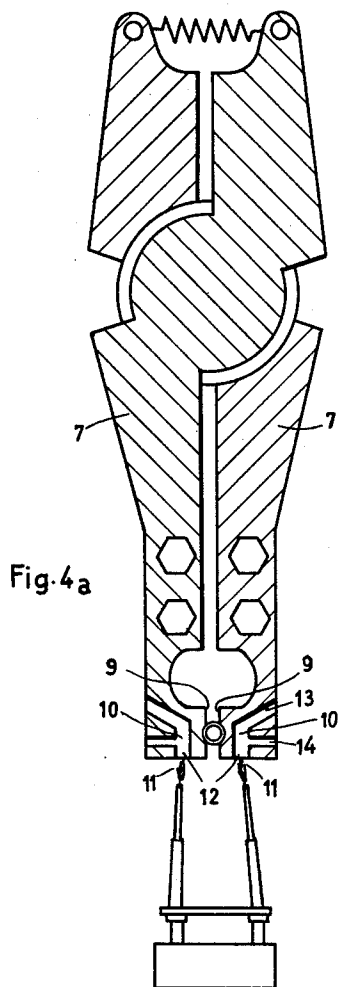


Fig. 4c

INVENTOR

Hans Wiedenmann

1

3,140,165

APPARATUS FOR TIPPING OFF THE EXHAUST APERTURES OF ENVELOPES FILLED WITH GAS AT A PRESSURE HIGHER THAN ATMOSPHERIC

Hans Wiedenmann, Heidenheim (Brenz), Germany, assignor to Patent-Treuhand-Gesellschaft für elektrische Glühlampen m.b.H., Munich, Germany

Filed Feb. 21, 1961, Ser. No. 90,890

Claims priority, application Germany Mar. 2, 1960

3 Claims. (Cl. 65—270)

This invention relates to a method and apparatus for tipping off the exhaust apertures of envelopes filled with gas at a pressure higher than atmospheric, more particularly of incandescent electric lamps and photoflash lamps of small dimensions.

In most of the tipping off methods known hitherto the glass is preheated at the pinch by means of gas burners so much that it obtains a proportionately high degree of plasticity and the lamp is, thereupon, sealed very quick by jaws movable against each other. In mass production of such lamps there are used rotary, indexing devices carrying on an annular turret a plurality of heads being carried successively through a series of stations. Heating of the exhaust apertures is made by means of gas flames on several stations, pinching of the lamp, however, takes place on a special station provided therefor. In consequence of unavoidable differences in thickness of the glass tubes as well as in intensity of the heating flames also the plasticity of the glass is different at this place whereby not only considerable differences in quality of the single pinches occur but also the intensity of obtainable filling pressure is restricted considerably. Owing to the fact that the pressure inside the lamps is above atmospheric the heated parts of the exhaust aperture tend to swell up and this danger is the greater the softer the glass is at this place. In spite of the fact that the maximum obtainable filling pressure may be increased to some extent by sorting out the semifinished products (e.g., the exhaust tubes) or by testing the softening point, control of the aforesaid reactions is very difficult in case of any increase in pressure and in rotational speed of the machines.

To increase the operation of such machines it is also well known to provide each head on the turret rotating step by step with a pair of pinching jaws. It is also known to omit preheating of the exhaust tubes by gas flames and to supply the required heat across electrically heated pinching jaws. For this latter purpose the pinching jaws rest during several working steps against the exhaust tube and heat it so much that the glass temperature increases steadily until the glass softens and the lamp is sealed by a pinching movement of the jaws. Although it is easier in this method to balance any occurring variations there exists in case of a filling pressure above 2 atm. also the danger that the lamp becomes unserviceable because the heated exhaust aperture swells up.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of an improved method for sealing the exhaust apertures of electric lamps by pinching jaws.

Another object of the invention is the provision of a method for sealing the exhaust openings of glass vessels filled with gas at a pressure exceeding 2 atm. by means of pinching jaws.

A further object of the invention is to provide an apparatus for sealing electric lamps and similar glass vessels filled with gas at a pressure exceeding 2 atm.

Still another object of this invention is the provision of pinching jaws of a special form for sealing the exhaust apertures of high pressure electric lamps.

2

It is another object of the invention to provide an alloy for those parts of the pinching jaws which come into contact with heated glass.

Other objects and advantages of the invention will become apparent as the description proceeds.

According to the invention the glass is heated proportionately quick by the adjoining pinching jaws up to a temperature at which the glass may, just, be formed by the pinching jaws resting on it with spring pressure. The glass keeps this temperature so long until the lamp is sealed by a progressive forming of the stem press.

The time from the beginning of heating until the desired forming temperature is obtained amounts to at most $\frac{1}{3}$ of the total time of heating. At least $\frac{2}{3}$ of the heating time are at disposal to shape the exhaust tube.

In a further development of the present invention heating in the last phase of the pinching process is increased so that after a long stay on a practically constant temperature a moderate short-time temperature increase occurs. Thereby it is made possible that the last phase of the pinching movement is made quicker.

Lamps containing gas at a pressure higher than the atmospheric are, preferably, tipped off on a machine of usual construction the indexing rotary turret of which carries a plurality of heads taking one after the other different operating positions. In the first operating station the lamps are inserted into tightening sleeves and in the last station the exhausted, gas-filled and pinched lamps are removed and are brought to the basing machine. It is a special feature of the machine used for carrying out the method described in the present invention that each head is provided with a pair of pinching jaws rotating together with the head on the machine. Heating of the place on the lamps to be pinched off is made under omitting direct heating of the glass but exclusively by means of the pinching jaws heated with gas and resting against the pinch. According to the invention the pinching jaws rest under spring pressure against the pinch of the lamp already in the operating station which follows directly those stations in which the lamp is inserted and the sleeve is tightened round the exhaust tube so that the pinching jaws rest against the pinch during the greatest part of the rotation of the machine, that means in all operating stations with the exception of those stations in which the lamps are inserted or removed. Furthermore, the pinching jaws are heated by gas flames very soon after being put against the pinch so that the pinch has proportionately quick such a temperature at which the glass may be formed by means of the pinching jaws resting against it with spring pressure. This heating-up may, for instance, be made in the course of five operating stations and may take about 15 sec. Heating in the following stations is adjusted in such a manner that the glass remains at this temperature and that a gradual deformation of the pinch takes place by means of the pressing force applied to the lamp when it rotates on the machine. The lamp is already exhausted before the cross section of the exhaust aperture is made smaller by the gradual deformation. Thereupon, the lamp rotating on the machine is filled with gas at a pressure greater than atmospheric whereby it is of no importance if the cross section of the exhaust aperture has become already smaller during the filling operation. When the lamp is filled with gas some heat is taken off from the pinch because the cool gas passes; therefore, it is recommended to apply more heat in the respective stations. The gradual deformation by which the pinch is finally sealed may, for instance, take 25 sec. and takes place in eight operating stations.

The pinching jaws or, preferably, those parts of the pinching jaws being provided-for to rest against the pinch of the lamp consist of an alloy composed of chromium, tungsten, carbon and cobalt, and being known under the name "Haystellite" which alloy shows the advantage that

hot, softened glass does not adhere to it and that, consequently, tools consisting of it may be separated easily from glass so that it is not necessary to provide the pinch with a coating of graphite or of any other material which acts against any adhering or sticking. A further advantage of the aforesaid material consists in its tinderproofness so that it is possible to bring the pinching jaws by means of gas flames to such high temperatures which are required for this procedure. This material is particularly suitable for the manufacture of tools used for glass treatment which are even hotter than glass and which serve, simultaneously, to heat the glass to be formed.

According to the invention the pinching jaws have one or several borings passing through them to which gas flames are directed which serve for heating. The borings are made in such a manner that the glass is not heated directly by flames and that, more particularly, sensitive parts, as current inleads, metal glass sealings or paste-board collars of photoflash lamps, cannot be impaired by flames. The flames directed to the borings heat the pinching jaws indirectly only but quite effective by chimney effect in such a manner that the hot gases of the flames are driven through borings provided-for in the pinching jaws.

The above described pinching jaws rotate with their appropriate heads on the machine whereas the burners serving to heat the pinching jaws are stationary and are mounted so that their flames are directed to the apertures provided for in the pinching jaws during the pauses which lie between the stepwise movements of the machine.

For a better understanding of the present invention reference should be had to the accompanying drawings.

FIG. 1 shows the temperature change of the pinch in the course of time during rotation of the lamp on the machine.

FIG. 2 shows schematically a rotating machine for sealing lamps containing gas at a pressure higher than atmospheric, by means of a slow deformation of the pinch in nearly the total time in which the machine rotates.

FIG. 3 shows the different phases of pinching in the time of rotating on the machine.

FIG. 4 shows a pair of pinching jaws with borings having a chimney effect and with the appropriate pair of burners.

FIG. 1 shows the temperature at the pinch in the course of time in schematical view. After having put the lamp into the exhaust device on point A the pinching jaws are closed at the pinch and rest against this latter with a certain temporary constant pressure even before point B is reached. Thereupon, the pinching jaws are heated and transfer their heat to the glass of the pinch which is brought in proportionately short time to a temperature T_w at which under the influence of the pressure lying on the pinching jaws a slow deformation is possible. The temperature is, however, taken so low that a quicker deformation would lead to a breakage of the glass. Between points C and D the pinch is, practically, kept at this temperature whilst the lamp is exhausted and the exhaust aperture is closed slowly. Nearly in point D gas is filled into the lamp whereby under certain circumstances a short time drop of the pinching temperature may be caused which may, however, be balanced by increasing the heat of the burners in this time. A short time before the pinch is completely sealed there may be brought about a short time rise of the temperature at the pinch whereupon the heating flames, however, are removed, disconnected or very much weakened.

FIG. 2 shows schematically a rotary machine for applying the method according to the invention. Around a stationary machine part 1 there is provided a rotating turret 2 carrying 36 heads 3 and just as many pinching jaws 4 for the heads, and bringing every head one after the other by an indexing movement into 36 working positions.

Every jaw is pivoted round an axis 5 lying in parallel with the lamp axis so that it is rotating with a trifling friction only round this axis by means of well known technical means under maintaining the mutual position of the two pinching jaws. By this measure there takes place on closing the pinching jaws 4 an automatic centering of the pinching jaws with regard to the exhaust tube to be sealed-off and there may, in this manner, be balanced petty inaccuracies in the position of the pliers holding the lamps.

In station A there are inserted into the machine the next lamps not yet exhausted and are, then connected in vacuum-tight manner with the exhaust lead or with a vacuum chamber, if provided-for. As soon as exhaustion of the lamps begins, the pair of pinching jaws belonging to the respective lamp closes round the pinch and is, thereupon, e.g., from station B onward, heated by gas flames 6. The gas flames 6 are, in contrary to the pinching jaws, stationary so that the same gas flame heats successively all pairs of pinching jaws with that intensity which corresponds to the respective station. The gas flames are adjusted in such a manner that, say in station C, such a temperature of the pinch is obtained at which a slow deformation of the glass occurs by means of the abutting pinching jaws and that this temperature is kept, practically, constant during the following rotation of the machine. After having exhausted the lamp, gas is filled-in near station D while a stronger heating of the jaws balances the heat loss suffered by the pinch through the passing gas so that in station E sealing of the lamp is finished whereupon no further heating of the pinching jaws takes place. When jaws and pinch are cooled down a little then in one of the subsequent stations the pliers open and the tipped-off lamps may be removed and the pinch may, if desired, be sealed or coated with artificial material and the remaining exhaust tube may be withdrawn.

FIG. 3 shows the different phases of the pinching during rotation of the lamp on the machine. As shown in FIG. 3a the jaws 7 rest already against the pinch of exhaust tube 8, deformation has, however, not yet taken place. In FIG. 3b the desired temperature has, already, been obtained, deformation of the pinch begins and continues during the further rotation of the machine and during further exhaustion of the lamp as shown in FIGS. 3c and 3d until, as shown in FIG. 3e, the exhaust aperture is very much contracted and the lamp completely exhausted and is, thereupon, filled with gas. By increased heating final pinching of the exhaust tube and removing the lamp from the remaining exhaust tube may be made somewhat quicker so that the interval between the different conditions according to FIGS. 3f and 3g is somewhat shorter than between the other phases of the pinching process.

FIGS. 4a, 4b and 4c show the pinching jaws according to the present invention by way of an example. The pinching plier parts 7 movable against each other consist of a temperature-resistant stainless steel and have cutting edges of an alloy of chromium, tungsten, carbon and cobalt. There has proved especially advantageous a material consisting of 40% of sintered tungsten carbide and of 60% of an alloy composed of 28% chromium, 4% tungsten, 1% carbon and of the rest of cobalt. It is, however, also possible to make greater parts of the pliers, say the entire pinching jaws, from an alloy which is known under the name "Haystellite." These parts may be connected with the other parts of the pliers in different manner; that part made of Haystellite, for instance, may be welded on the steel. This latter welding is, preferably, made with threefold excess of gas whereupon also an oxidizing treatment of the pinching surfaces takes place in order to prevent any sticking on touching the hot glass. The pinching jaws are provided with borings 10 which pass from one jaw surface to the other. The flames 11 are directed in the single stations so that they are pointing at apertures 12 of borings 10, that the hot flame gases flow through the borings having chimney effect and heat, thereby, the jaws. It is possible to use either one boring

5

passing therethrough or to divide the chimney and, thereby, to provide beside one inlet aperture several outlet apertures. According to FIG. 4 there is provided a chimney boring at which the hot gases entered into the inlet aperture 12 may bifurcate and may escape from two outlet apertures 13 and 14. It is quite advantageous but not necessary to make the borings in such a manner that the flame gases may rise somewhat from below to above, that, consequently, the inlet aperture is provided lower than the outlet aperture. Besides, it may, perhaps, be desirable to provide on each pair of pliers several channels with several inlet apertures for various flames or flame bundles.

Every pair of pliers carrying the pinching jaws is mounted pivotably round an axis in parallel with the lamp axis under maintaining the mutual position of the two pinching jaws.

Although a preferred embodiment of the invention has been disclosed it will be understood that modifications may be made within the spirit and scope of the appended claims.

I claim:

1. Apparatus for sealing glass tubulations which open into glass envelopes, said apparatus comprising,
 - (a) a turret rotatable with an indexing motion,
 - (b) a plurality of heads carried on said turret and rotatable therewith, and each of said heads adapted to retain one of said tubulations to be sealed,
 - (c) a separate pair of pinch jaws associated with each of said heads and rotatable with said turret, and each of said pinch jaws provided with apertures extending therethrough between preselected surfaces of said pinch jaws,

6

(d) each of said pinch jaws adapted to be closed about one of said head-retained tubulations to be sealed and to be urged with a constant pressure against such head-retained tubulations, and

(e) a number of stationary gas burners positioned about the periphery of said turret and having flames directed into the apertures of said pinch jaws during the period said turret is stationary between indexes and after said pinch jaws have been closed about said head-retained tubulations to be sealed.

2. The apparatus as specified in claim 1, wherein the portions of each of said pinch jaws which are urged against said tubulations are formed of a chromium, tungsten, carbon, and cobalt alloy which will not adhere to glass in a softened state.

3. The apparatus as specified in claim 2, wherein the portions of each of said pinch jaws which are urged against said tubulations are formed of an alloy consisting of 40% tungsten carbide, 28% chromium, 4% tungsten, 1% carbon, and the balance cobalt.

References Cited in the file of this patent

UNITED STATES PATENTS

1,929,313	Illingworth	Oct. 3, 1933
2,014,471	De Neumann	Sept. 17, 1935
2,265,359	De Neumann	Dec. 9, 1941
2,265,381	Malley	Dec. 9, 1941
2,248,647	Strickland	July 8, 1941
2,273,441	Gustin	Feb. 17, 1942
2,403,073	Geiger et al.	July 2, 1946
2,923,113	Tyson	Feb. 2, 1960