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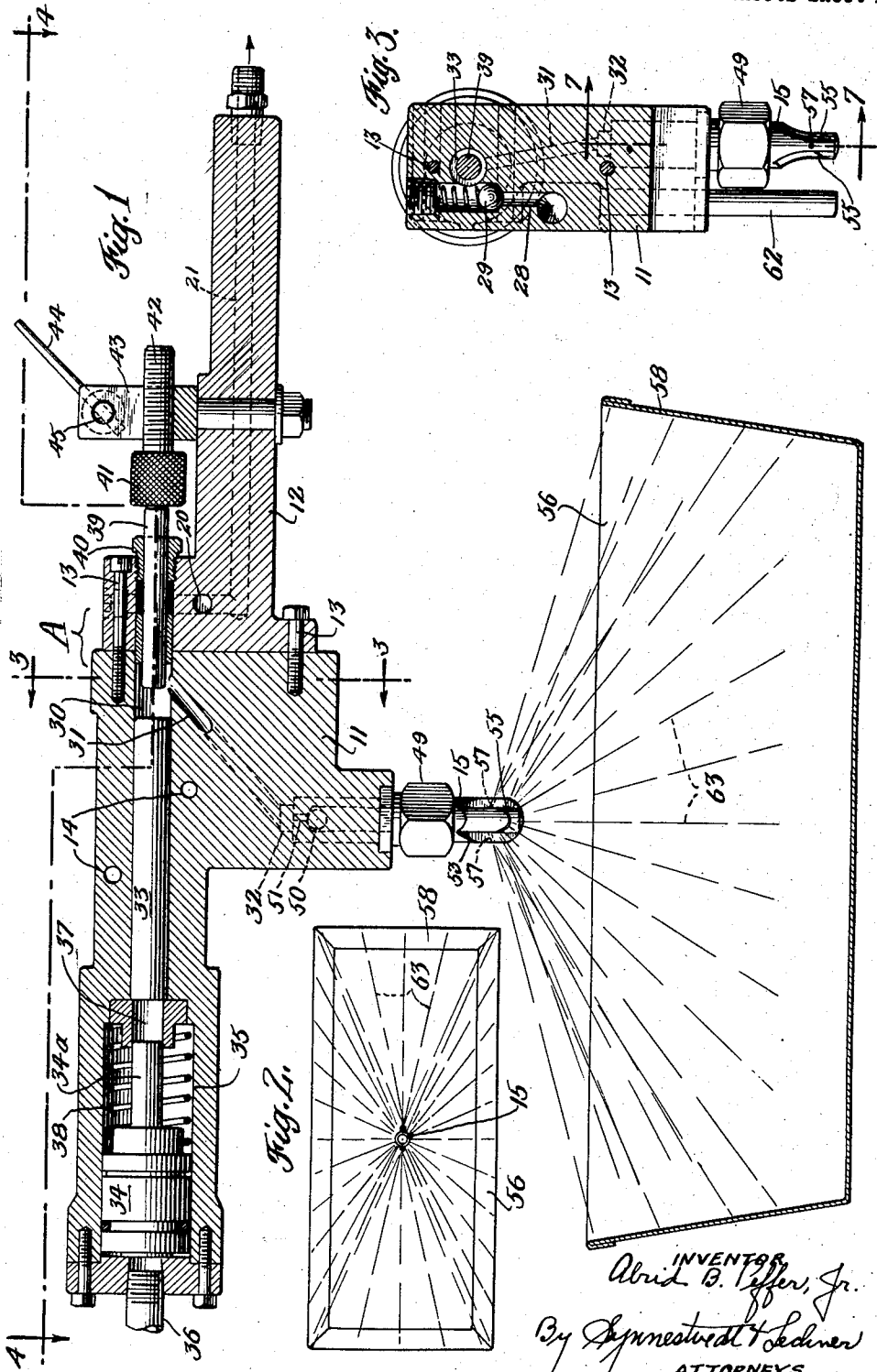
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APPARATUS FOR SPRAY-GREASING BAKING PANS

Filed May 13, 1957

2 Sheets-Sheet 1



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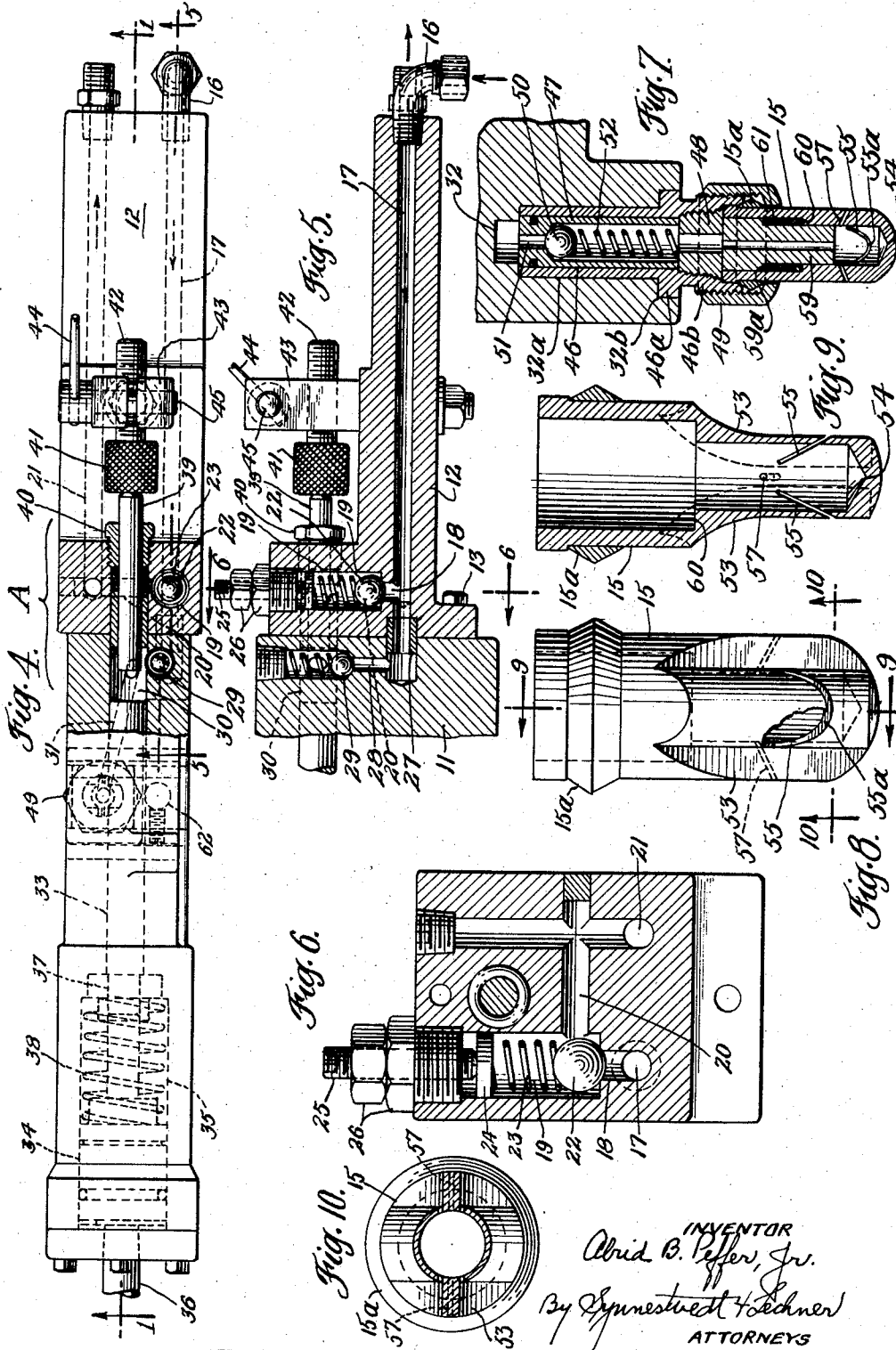
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APPARATUS FOR SPRAY-GREASING BAKING PANS

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2 Sheets-Sheet 2



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APPARATUS FOR SPRAY-GREASING BAKING PANS

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4 Claims. (Cl. 239—124)

This invention relates to apparatus for greasing pans such as are used by large commercial bakeries in the baking of bread, cake and the like.

The principal objects of the invention are to provide equipment for this purpose which will yield the following advantages, namely, simplify and reduce the cost of manufacture; increase the efficiency and rapidity of the greasing operation; reduce the consumption of grease and minimize wastage thereof; distribute the grease more uniformly over the sides and ends of the pans even where the length of the sides is materially greater than the width of the ends; avoid the mechanical complications heretofore characteristic of some prior art devices by mounting the nozzle in a fixed position above the side edges of the pans; arrange for downward spray discharge into the upwardly opening pans without dripping and without the need for a yieldable shut-off valve at the nozzle tip where the discharge takes place; increase dependability so that the greasing mechanism will operate without failure at high speeds for long periods of time; and reduce the frequency of servicing shut-downs heretofore necessary with previous machines especially those of the type in which the greasing nozzle is moved downwardly to a point where the nozzle outlets are below the edges of the pans.

How the foregoing together with such other objects and advantages as may appear herein or are incident to my invention are attained is illustrated in preferred embodiment in the accompanying drawings wherein:

Figure 1 is a vertical longitudinal section taken on the line 1—1 of Figure 4 including a diagrammatic indication of the spray pattern delivered by the nozzle;

Figure 2 is a plan diagram on a smaller scale than Figure 1 also indicating the spray pattern of the nozzle;

Figure 3 is a vertical cross section taken as indicated by the line 3—3 on Figure 1;

Figure 4 is a plan view partly in section as indicated by the line 4—4 on Figure 1;

Figure 5 is a fragmentary horizontal section taken on the line 5—5 of Figure 4;

Figure 6 is a cross section on an enlarged scale taken as indicated by the line 6—6 on Figure 5;

Figure 7 is an enlarged cross section taken as indicated by the line 7—7 on Figure 3;

Figure 8 is an elevational view of the nozzle tip on a still further enlarged scale with a portion broken away to illustrate detail;

Figure 9 is a vertical section taken as indicated by the line 9—9 on Figure 8; and

Figure 10 is a section on the line 10—10 of Figure 8.

As will be seen my improved spraying apparatus includes a main body portion A formed for certain convenience in manufacture in two parts 11 and 12 which are suitably secured together by screw bolts 13. This body structure can be mounted on any supporting frame work (not illustrated) by means of the mounting holes 14.

Projecting downwardly from the member 11 of the

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body is the spraying nozzle 15 the details of which form an important part of my invention and will be described more fully below.

Grease is delivered under relatively high pressure from a source of supply (not illustrated) through a pipe connection 16 to the grease receiving conduit 17 in the body portion 12, the direction of grease flow being indicated by the arrows. Near the inner end of conduit 17 a vertical passageway 18 connects with a chamber 19 and a transverse passageway 20, the latter in turn communicating with the return circulation conduit 21 (see particularly Fig. 6) which delivers the grease back to the source of supply as indicated by the arrows in Figs. 1 and 4. Passage 18 is controlled by a pressure relief valve in the form of the ball valve 22 yieldably held against its seat by the spring 23, the tension of which spring can be altered by means of the adjustable spring plate 24 and the screw 25 which latter projects inwardly from the outside and is held in positions of adjustment by means of the lock nuts 26. In other words, the grease comes in through 17 under relatively high pressure from a constantly operating pump at the source of supply (not shown) and the valve 22 is set to open at whatever pressure it may be desired to maintain in the spraying apparatus, the circulation being continuous in order to maintain the temperature substantially constant, it being understood, of course, by those skilled in the art, that the grease is heated to maintain reasonable fluidity.

At its inner end and at a point just beyond the passage 18, the delivery conduit 17 is continued into the portion 11 of the body as clearly shown in Fig. 5, a suitable bushing 27 being introduced between the two members 11 and 12 in order to properly seal the passageway. A communicating passageway 28 delivers the grease past a check valve 29 to the metering chamber 30. From the metering chamber another passageway 31 carries the grease to the cavity 32 with which cavity the interior of the nozzle 15 is connected as will further appear.

The metering chamber 30 is formed as an elongated cylinder in which is mounted for reciprocation a grease piston or plunger 33. When this piston 33 is moved to the right as viewed in Fig. 1 the grease which is trapped in the metering chamber 30 will be forced through the passage 31 to the nozzle, check valve 29 closing when this takes place.

The piston 33 may be actuated in any desired manner preferably by an air actuated motor device having a piston 34 operating in the cylinder 35, the air pressure being applied through a pipe 36 under the control of suitable mechanism not illustrated herein since it forms no part of the present invention. Suffice it to say that when the air comes in, the piston 34 is moved with great suddenness to close the gap 37 between the end of the piston 33 and the end 34a of the piston 34. In this way, there is a sudden impact or blow delivered from the end 34a to the piston 33 which forces the grease outwardly through the nozzle with sufficient increase in pressure to substantially atomize the grease as it discharges through the nozzle delivery passages to be described below. A spring 38 returns the piston 34 to its starting position after each blow which it delivers to the piston 33 and the piston 33, of course, is returned by the pressure of the oil again entering to refill the metering chamber 30.

The amount of grease which will be discharged from each stroke of the piston 33 is determined by the position of the metering rod 39 which projects inwardly toward the piston 33 through a suitable packing gland 40. The outer end of the metering rod 39 abuts against the knurled head 41 of the screw 42 which passes through the clamping jaws or lugs 43. Adjustment is made by turning the knurled nut 41 and then clamping the screw 42 in the

jaws 43 by means of the handle 44 which rotates a threaded clamping bolt 45.

The details of the nozzle structure will now be taken up. The cavity 32 is of stepped formation as shown to best advantage in Fig. 7, the inner portion 32 which connects with the grease supply conduit 31 being of smallest diameter. The intermediate portion 32a is formed to receive the sleeve 46 which latter is press fitted into position. Sleeve 46 has a collar portion 46a which fits into the largest diameter portion 32b of the cavity 32. The lower protruding end 46b of the sleeve 46 is both internally and externally threaded as shown in Fig. 7. Within the sleeve 46 is a valve housing 47 held in place by the threaded hollow plug or ferrule 48 the lower face of which plug forms a seat for the inner end of the nozzle member 15. Near its upper end the nozzle is provided with a positioning band 15a which is embraced by the nut 49 threaded on the outer surface of the portion 46b of the sleeve 46.

Within the valve housing 47 is an ordinary ball valve 50 adapted to seat upwardly against the grease connecting passage 51, the ball being normally held against its seat by means of a spring 52 which reacts between the ball and the inner face of the threaded apertured plug 48 as clearly seen in Fig. 7. The tension of this spring 52 is sufficiently great to maintain the ball 50 against its seat in order to close the grease delivery passage to the nozzle even against the pressure of the incoming grease which enters the metering cavity 30 past the check valve 29. In other words, the pressure relief valve 22 will open under the pressure of the grease supply before the valve 50 will leave its seat against the pressure of spring 52.

In order to open the valve 50 it is necessary to increase the pressure of the grease in the metering chamber 30 in the manner already described and when this occurs the grease will be forced past the valve 50 to the nozzle for discharge from the outlets at the nozzle tip now to be described.

The lower portion of the body of the nozzle, at two opposite sides, is reduced as at 53. The tip of the nozzle 54 in line with the central longitudinal passageway is closed so that no grease can discharge directly downwardly. In the relieved sides 53 are formed a pair of oppositely disposed continuously open grease discharging slits 55 which diverge outwardly from the center and which are arranged to face the long side walls 56 of the elongated baking pans shown in Figs. 1 and 2. The slits are formed by a suitable cutting tool which enters the wall at the desired angle and it will be noted that there is a greater width of metal to be traversed by the discharging grease at the lower point 55a of the slit than there is in the upper regions of the slit. This is of importance in that it acts as a retarding influence on the grease which can be sprayed through the slit and it should be noted that the width of the metal past which the grease must travel tapers gradually from the width at the base of the slit to the width at the point 55a which is the tip of the slit. This construction provides for a greater density of spray in the direction of the length of the side than it does in the direction of the depth of the side which is an important factor in obtaining a spray pattern which uniformly sprays the entire side of the pan.

Intermediate the slits 55 are a pair of continuously open grease discharging holes 57 which also diverge outwardly but at a far greater angle than do the slits 55. The reason for this greater divergence is that the holes 57 are designed to spray the grease against the end walls 58 of the elongated pans which walls, of course, are of considerably less dimension than the side walls 56. However, they are more remote from the nozzle and for this reason require a greater angle of divergence although they do not have to distribute as much grease as do the slits 55.

In connection with the general form and size relationships of my improved nozzle I wish to point out the following factors which are of importance. In the first place, it is necessary to construct the nozzle tip 15 with

sufficient strength to prevent damage to or breakage of the tip in case a pile up of the pans causes one of the pans to hit the tip during service. For this reason I prefer to manufacture my nozzle out of a piece of $\frac{3}{8}$ " O.D. tubing with a $\frac{5}{16}$ " interior passage. By relieving two opposite sides only as at 53 I retain the intermediate portions in their original thickness which gives the strength required. Indeed, even the relieved portions tend to act as braces at the sides and, therefore, provide for a measure of strength in this direction.

I prefer to relieve the sides 53 so that the tip into which the slits 55 are cut is approximately $\frac{1}{32}$ " in thickness. By forming the slits 55 in these relieved portions I am enabled to produce a slit which will spread or diverge the spray sufficiently to reach from end to end of each of the long sides of the pan which would not be true if the slits were formed through the complete thickness of the original tube. In other words, my construction provides slits which produce a spray pattern suitable for the long sides of the pans which would not be possible if the slits were formed through the full thickness of the tubing employed in making the nozzle. Of course, the angularity of the slits has an important effect upon the spray pattern and, as indicated above, I prefer to cut them at an angle of 48° from the horizontal because I find that this enables me to take care of practically all usual sizes of baking pans. Even where variations in angularity may be desirable I have found from experience that it requires something less than 5° variation to adapt the nozzle for any special size of pan. In fact, as a practical matter, it is seldom necessary to use a different angle. Similar changes in angularity may occasionally be useful insofar as the holes 57 are concerned but by and large the arrangement I have indicated with the holes formed at an angle of 15° from the horizontal will take care of practically all of the pans commonly in use.

By forming the slits and the holes in the manner described I provide for a well directed spray pattern which would not be possible if the nozzle tube were all of one dimension. The holes 57 are drilled through the full thickness of the metal and, therefore, provide directional discharge of the spray.

I now wish to call attention to the fact that the nozzle structure just described can be used without the interior member 59 which is shown in Fig. 7, but there may be instances when the member 59 of Fig. 7 will be of value in preventing, to as great a degree as possible, all wastage of grease by drip from the nozzle tip. This is particularly true in situations where the discharge passages 55 and 57 have to be made of slightly greater dimension than is ordinarily customary as will further appear.

In Figure 7 the member 59 is a sleeve which is slidable within the bore of the lower end of the nozzle tip. It is mounted in place before the nozzle tip is applied, and between a shoulder 59a on the upper end of the sleeve 59 and the shoulder 60 on the inner wall of the nozzle are provided a plurality of resilient O rings 61. When the grease is forced downwardly to be discharged from the nozzle the pressure is sufficiently great to force the sleeve 59 downwardly slightly to compress the O rings 61 to a small extent. Such compression will immediately return the sleeve to its upper position the instant the grease pressure is relieved after a discharge operation. This action helps to prevent drip of grease from the nozzle tip through the passages 55 and 57.

By way of example I wish to point out that the incoming grease which enters the conduit 17 may be delivered at a pressure as high as 250 lbs. per square inch, more or less, depending upon the individual unit and the preference of the bakery using the equipment. The spring 23 which holds the relief valve 22 against its seat may be set to permit the valve to open at a pressure of say approximately 20 lbs. which, of course, means that the pressure of the grease being delivered to the metering chamber 30 is also approximately 20 lbs. In turn the

valve 50 operated by the spring 52 must be arranged so that it will not open under normal conditions at this pressure of 20 lbs. but must wait until such time as the pressure of the grease coming from the metering chamber 30 is in excess of this pressure which, of course, takes place upon impact of the piston extension 34a upon the metering piston 33. In practice I have found that best results are secured by arranging the valve 50 with its spring 52 so that it will remain closed against as much as 80 lbs. pressure. This insures tight seating and even at a pressure of 80 lbs. the valve can be readily opened by the sudden blow which is struck by the piston extension 34a on the metering piston 33. When this occurs, the grease pressure in the metering cylinder 30 may go up to as much as 300 lbs. per square inch which is amply sufficient to secure instant opening of the valve 50 and discharge of the grease from the openings 55 and 57 with the required spread and atomization to thoroughly grease the inside of the baking pans. The general pattern of the spray is shown by the lines 63 in Figs. 1 and 2. In this connection, it will be noted that the individual spraying streamlets do not extend all the way to the bottom of the pan (see Fig. 1) because this is not necessary inasmuch as the grease will flow downwardly on the pan sides under the influence of gravity.

In my experience I have found that best results are secured by making the slits 55 approximately .008 of an inch in width. As for the holes 57 I prefer to make them approximately .040 of an inch in diameter. These relative dimensions will take care of the average size baking pan but it will be understood that in the case of very small pans or especially large pans these dimensions might have to be varied. Actually it is a simple matter to have in stock a number of nozzles with various combinations of sizes of slits and holes to take care of different sized pans.

Another factor which is important in securing optimum greasing operation is the angle of the slits 55 and the holes 57. For baking pans of average size, my experience indicates that the slits should be angled upwardly and inwardly at approximately 48° from the horizontal whereas the holes should be angled upwardly at approximately 15° from the horizontal. These angularities will produce satisfactory divergence of the greasing streams discharging from the nozzle for most pans in general use. Of course, for very small or for very large pans, these angles can be varied as may be necessary.

Finally, I wish to point out as already indicated that the combination of a nozzle having the slits and the apertures which are characteristic of my improved structure, when used in combination with the valve 50 which is located just back of the nozzle tip, enables me to almost completely avoid wastage or drippage of grease during the small interval of time which occurs between the greasing of one pan and the arrival of the next pan. This is something which has not heretofore been possible with any type of nozzle with which I am familiar. Even nozzles of the type which have a spring held closing valve at the tip and which discharge laterally upon increase of grease pressure sufficient to open the valve never seem to function satisfactorily and are generally wasteful of grease because of dripping as well as messy in operation. I attribute my success in overcoming this problem to the combination of the type of discharge openings which I employ with the closure valve 50 back in the line behind the nozzle. A valve such as the ball valve 50 can be made to seat very tightly whereas a larger poppet type valve such as those which have been employed heretofore at the tip of a nozzle can never be made to seat quite accurately and furthermore, the slightest speck of dirt between the seating surfaces will create a tendency to leak.

The slidable member 59 coupled with the O rings 61 has a tendency to even further improve the operation of the apparatus I have developed although I wish it to be

understood that it is not always necessary to employ this inner member 59 and the O rings 61.

I wish to point out that my improvements involve the use of a nozzle which is located at a point well above the sides of the pans and also that the nozzle does not have to move downwardly to project into the pans in order to effectively accomplish the greasing operation. This is a very important feature because it avoids the necessity for any complicating mechanical means for moving the nozzle into and out of the pans as they pass the grease delivery point on the conveyor mechanism normally employed in machines of this kind. It also minimizes the possibility of damaging or breaking off the nozzle tip as sometimes occurs if the tip comes into contact with the moving pans. In order to increase the safety factor, I have provided the guard pin 62 which faces the necessity for incoming pans in advance of the nozzle. Occasionally the pans will pile up or "pickaback" as they express it in the industry, and when this occurs, it would be possible for the pile-up to contact and damage the nozzle. This is prevented by the guard 62.

I claim:

1. Apparatus for greasing baking pans including a body structure, a nozzle supported thereby, normally open grease-discharging spray passages delivering downwardly from the nozzle, a conduit in the body receiving grease under relatively high pressure, a metering chamber in the body, a grease supply conduit connecting the metering chamber with the high pressure grease receiving conduit, a grease delivery conduit connecting the metering chamber with the nozzle, a return circulation conduit connected to the receiving conduit, a relief valve between the grease receiving conduit and the return circulation conduit, a yieldable valve normally closing the nozzle connecting conduit, said yieldable valve being adapted to maintain the nozzle conduit closed at a pressure at least as high as that which is sufficient to open the relief valve, a metering piston adapted to force grease from the metering chamber past the said yieldable valve and discharge it from the nozzle spray passages, a motor device for actuating said metering piston, and a check valve for preventing return flow of grease from the metering chamber back through the conduit which supplies the grease to the chamber, said nozzle being provided with a slideable sleeve immediately in back of the spray passages, and a resilient means supporting said sleeve, said sleeve being adapted to be moved slightly to compress said resilient means when said metering piston forces grease from the nozzle spray passages and said resilient means being adapted to return said sleeve to its normal position immediately after the discharge is effected.

2. In apparatus for spray greasing elongated baking pans, the combination of a nozzle comprising a body having a bore adapted at one end to receive the grease under normal pressure, the opposite end being provided with a pair of opposed, diverging, open grease-discharging spraying slits formed in the side wall of the body, a pair of opposed, diverging, open, grease-discharging spraying holes in the body wall intermediate said slits, the said holes being formed to diverge at a greater angle than the slits, a ball valve having a seat at the grease receiving end of the bore, and yieldable means normally holding said ball valve on its seat against said normal grease pressure, said valve being adapted to open upon increase of grease pressure sufficient to overcome the pressure exerted by said spring.

3. A nozzle according to claim 2 wherein the wall of the body where the slits are provided is materially reduced in thickness as compared to the wall through which the holes are formed.

4. In apparatus for spray greasing elongated baking pans, the combination of a nozzle comprising a body having a bore adapted at one end to receive the grease under normal pressure, the opposite end being provided with

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a pair of opposed, diverging, open, grease-discharging spraying slits formed in the side wall of the body, a pair of opposed, diverging, open, grease-discharging spraying holes in the body wall intermediate said slits, the said holes being formed to diverge at a greater angle than the slits, a ball valve having a seat at the grease receiving end of the bore, a slideable sleeve immediately in back of the slits and the holes, and resilient means supporting said sleeve, said sleeve being adapted to be moved slightly to compress said resilient means when the pressure of the grease is increased sufficiently to open the ball valve and said resilient means being adapted to return said sleeve to its normal position when the grease pressure returns to normal.

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