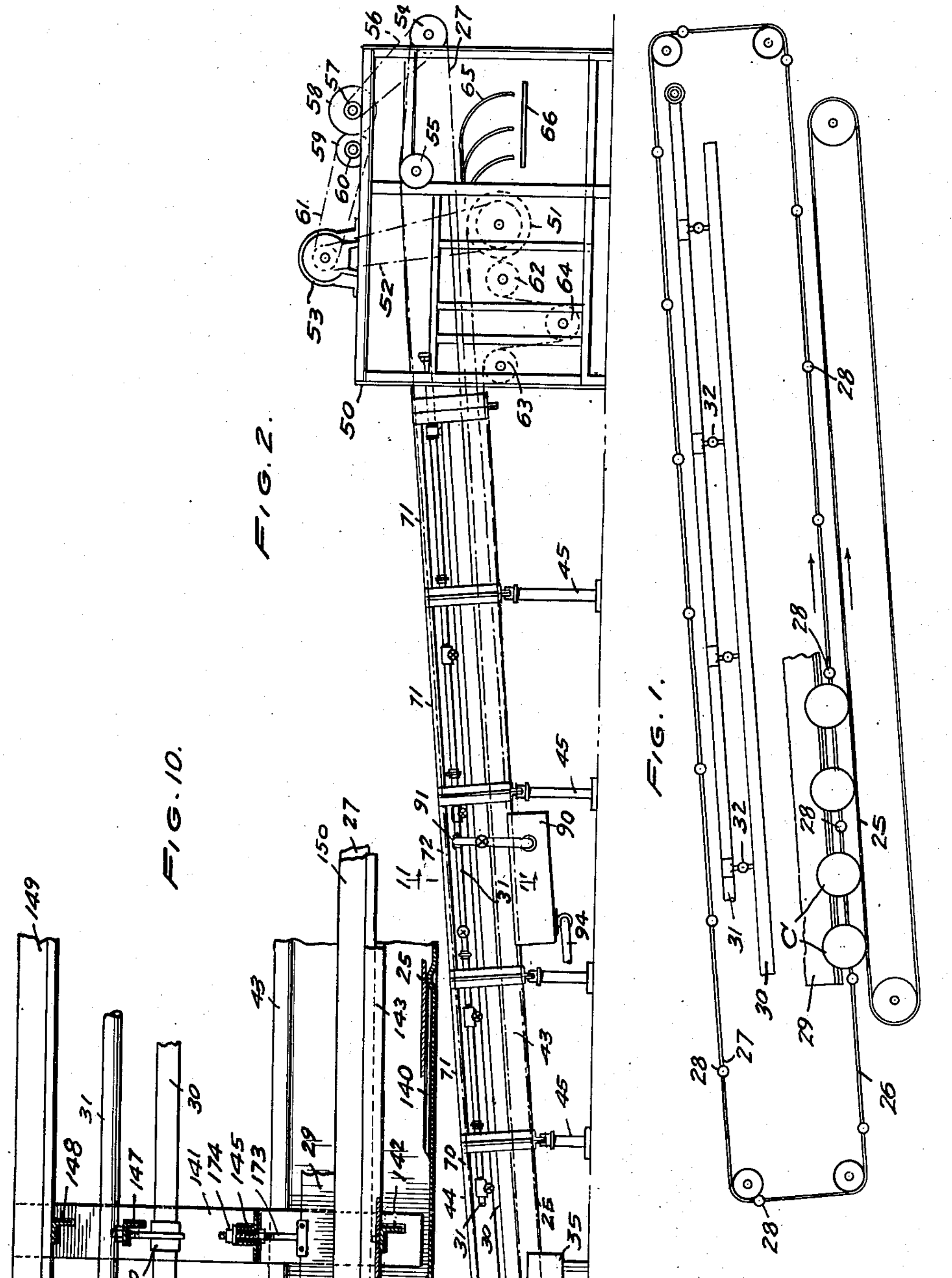
Aug. 2, 1949. D. E. LEONARD 2,477,992

CAN COOLING MACHINE

Filed Feb. 10, 1947

8 Sheets-Sheet 1



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CAN COOLING MACHINE

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8 Sheets-Sheet 2

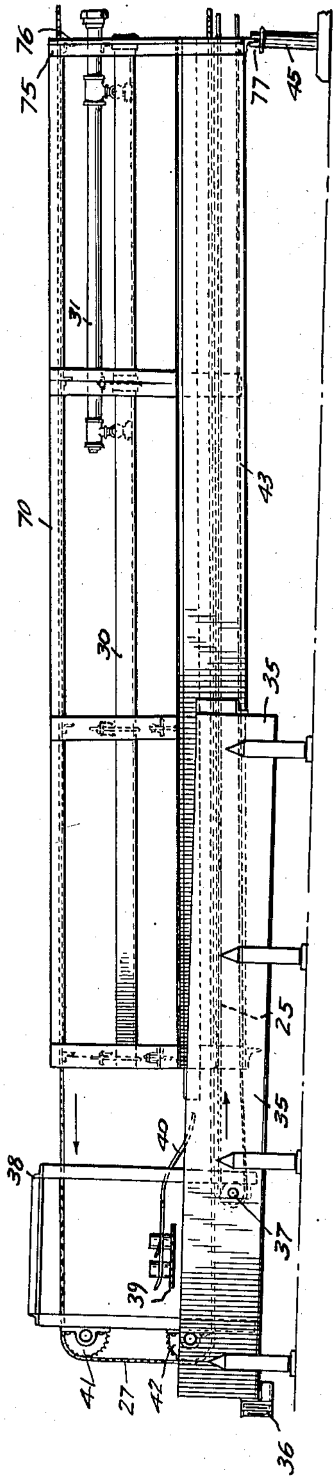

FIG. 3.

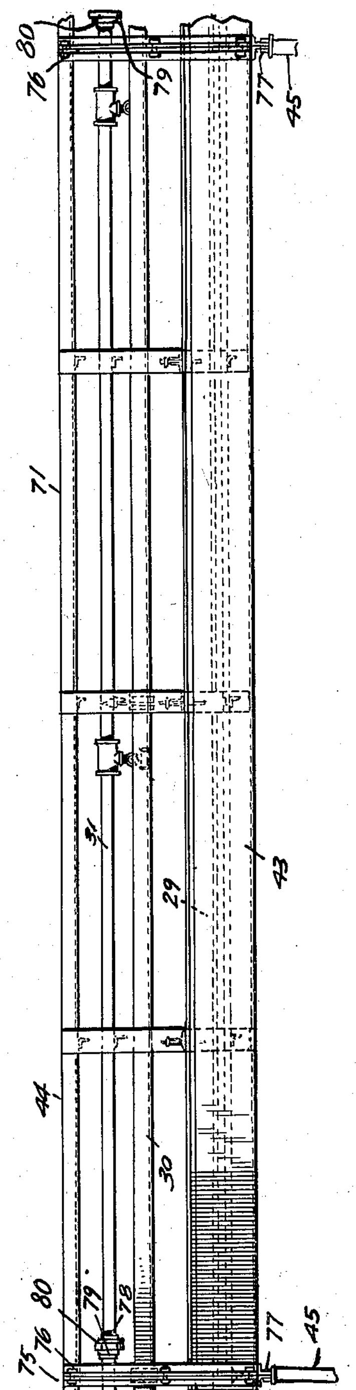

FIG. 4.

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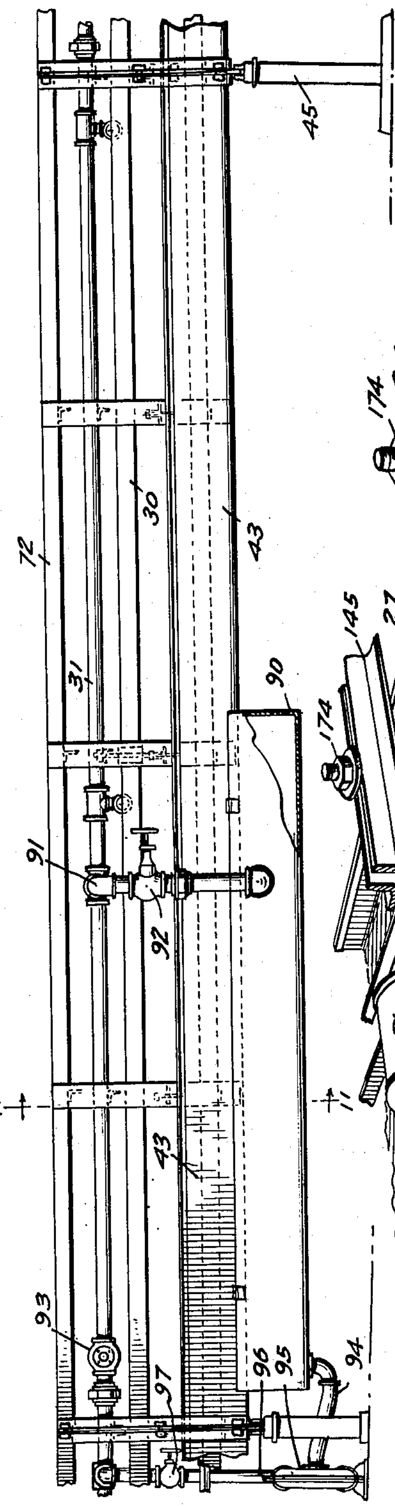

FIG. 5.

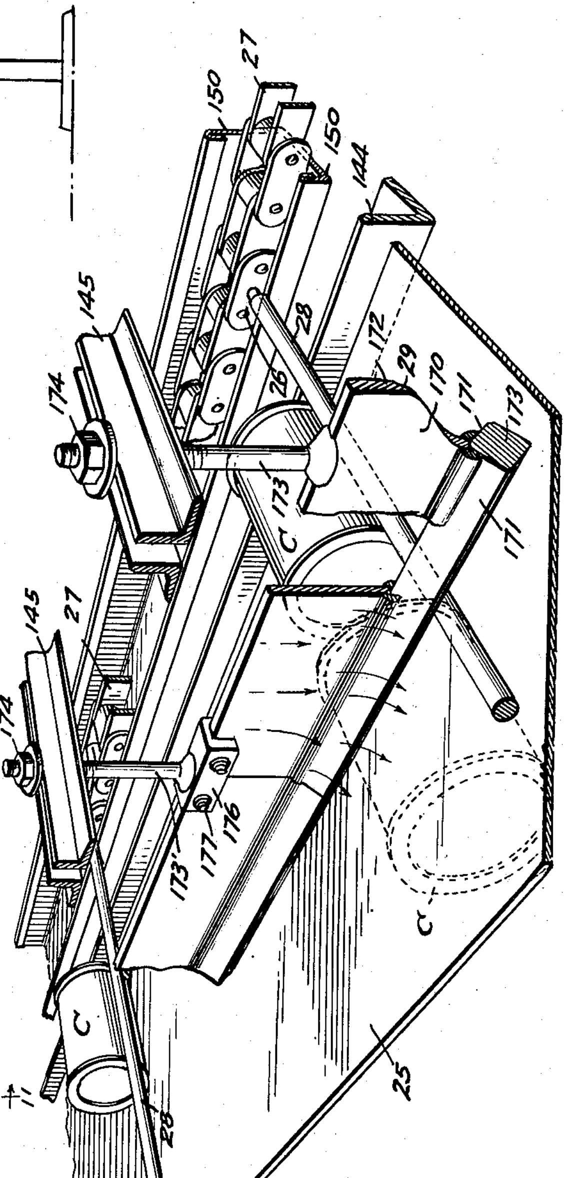

FIG. 21.

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CAN COOLING MACHINE

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FIG. 7.

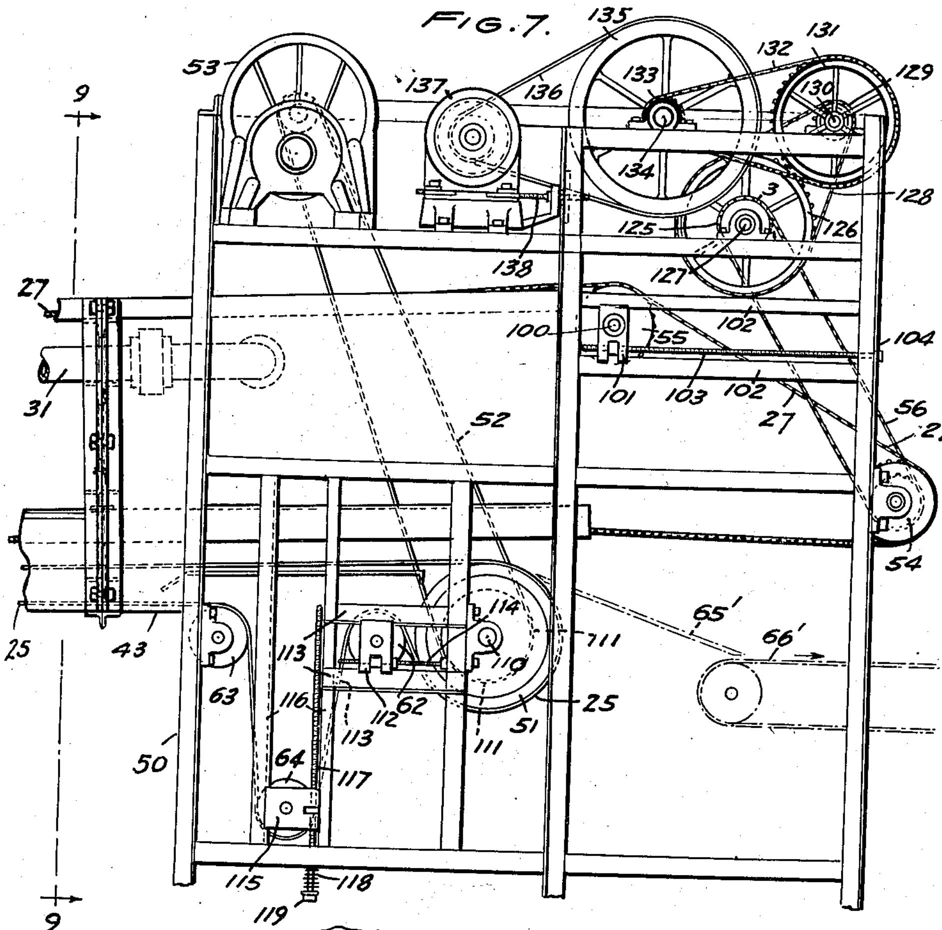
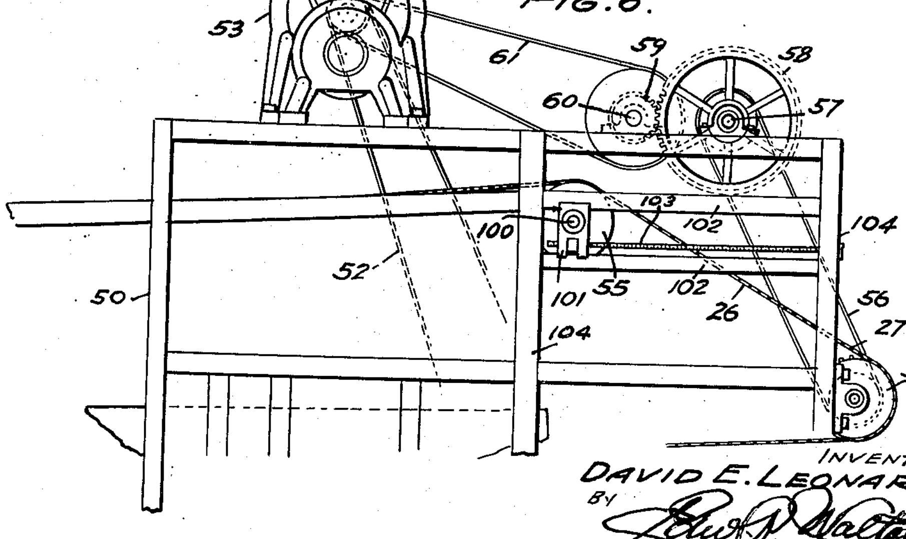


FIG. 6.



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CAN COOLING MACHINE

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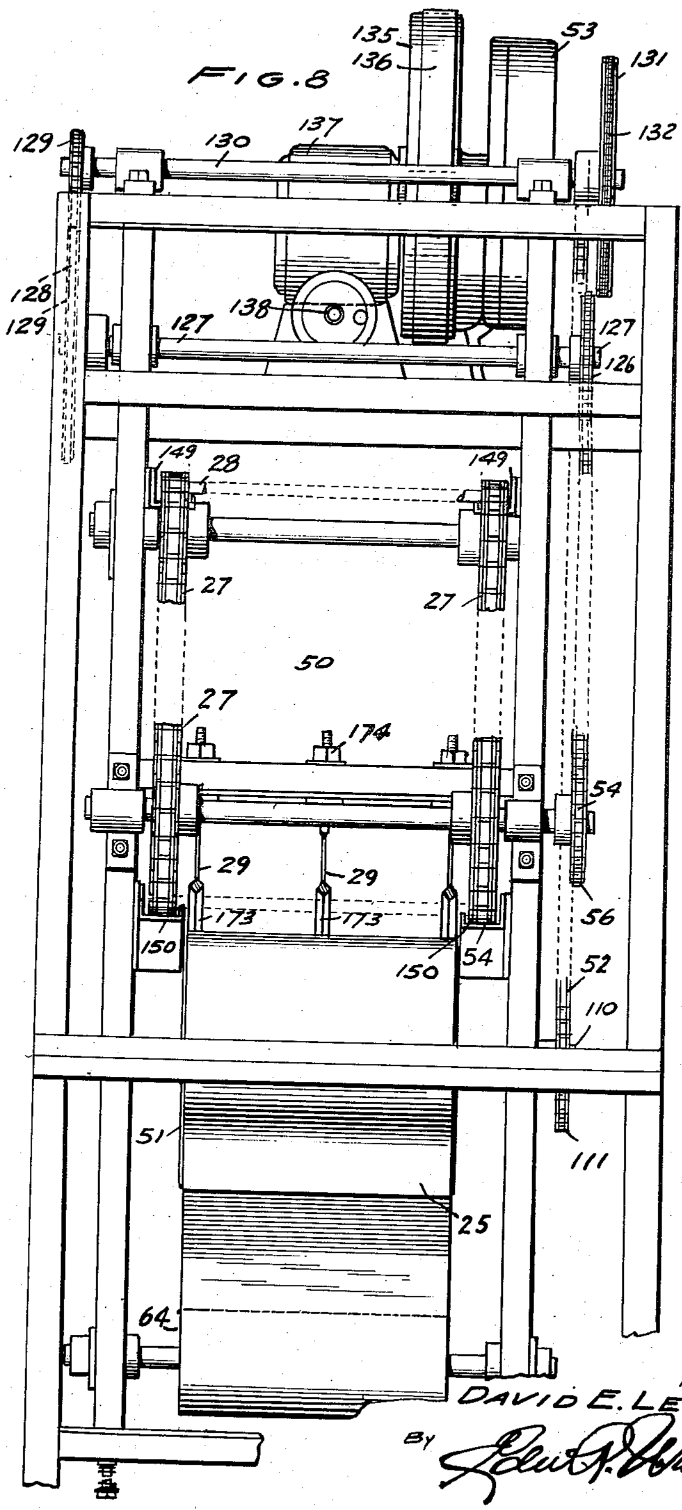
FIG. 8



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CAN COOLING MACHINE

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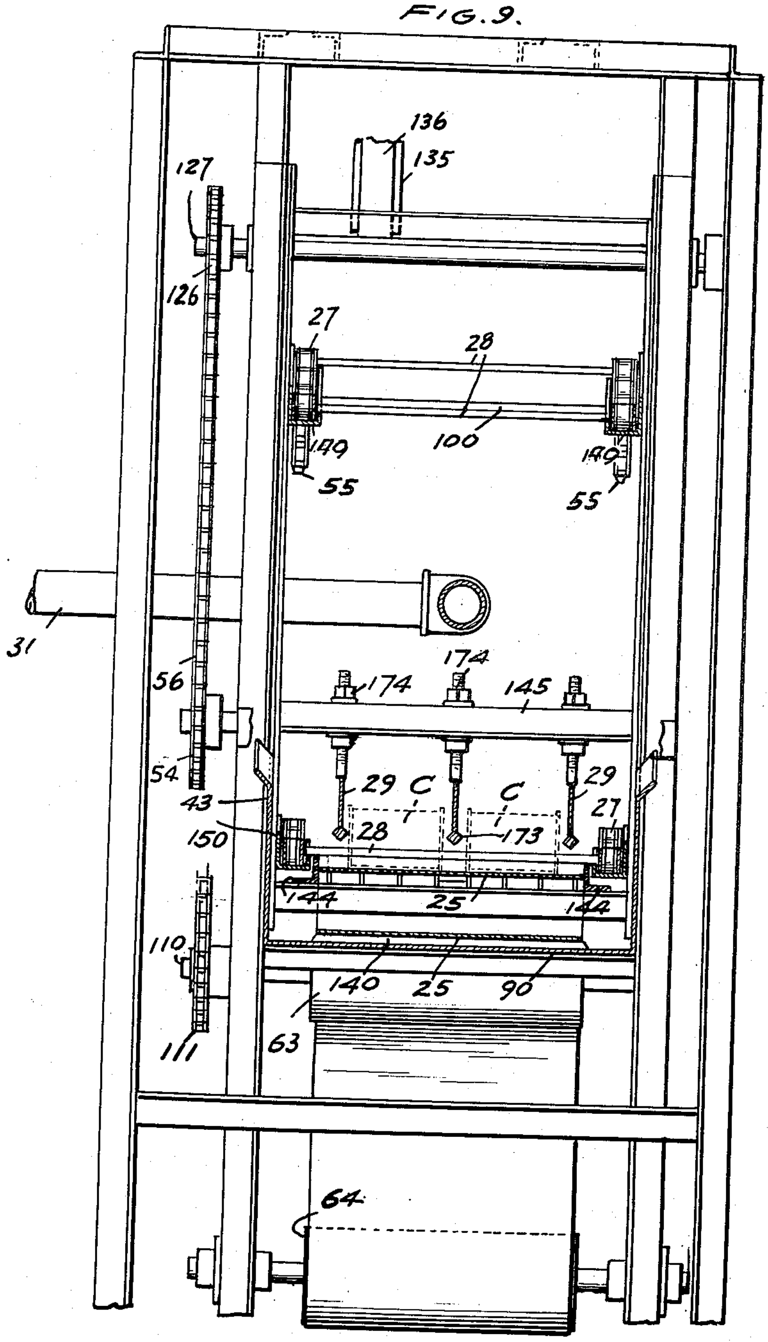
FIG. 9.



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CAN COOLING MACHINE

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FIG. 16.

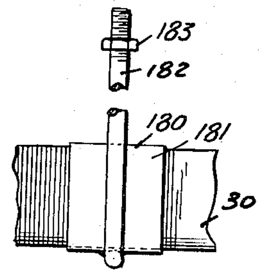


FIG. 17.

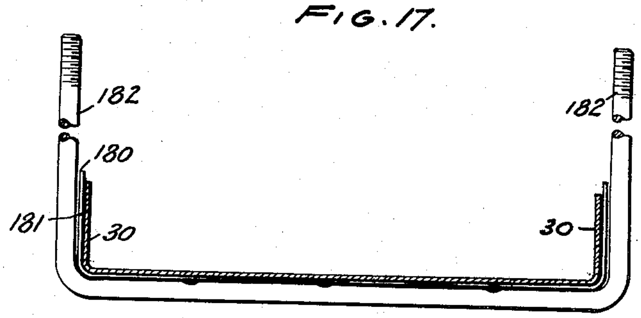


FIG. 11.

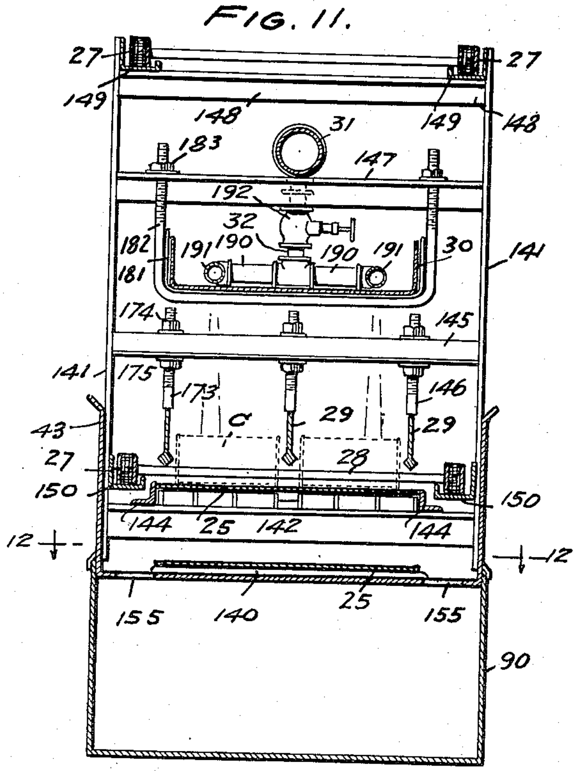


FIG. 18

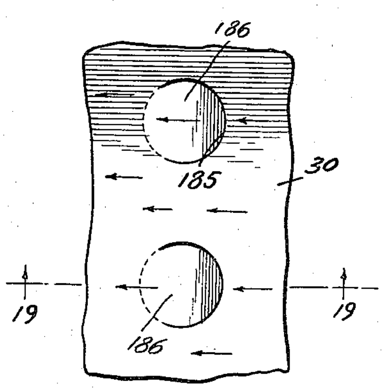


FIG. 19

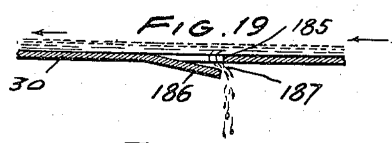
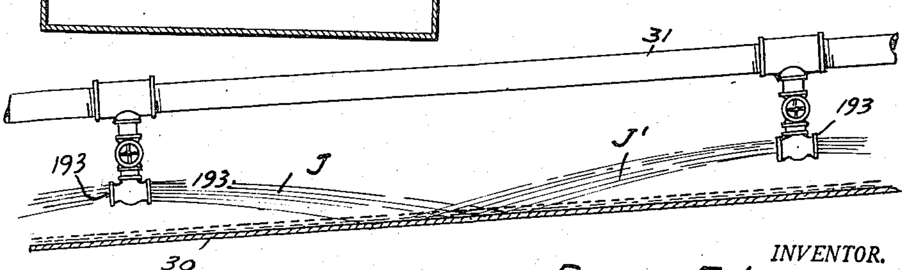


FIG. 20



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CAN COOLING MACHINE

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FIG. 13.

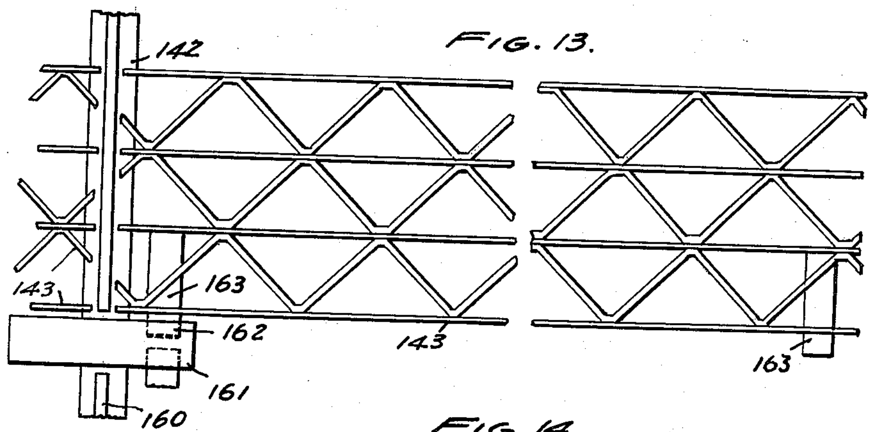


FIG. 14.

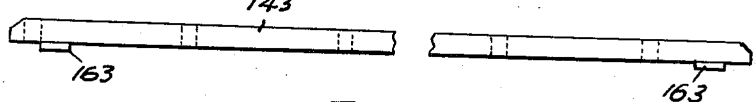


FIG. 15.

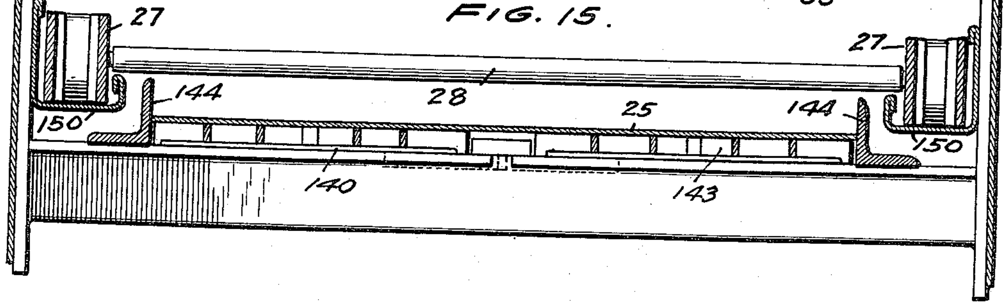
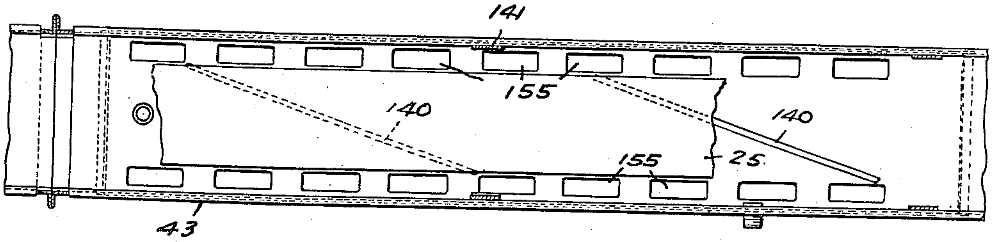


FIG. 12.



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Patented Aug. 2, 1949

2,477,992

UNITED STATES PATENT OFFICE

2,477,992

CAN COOLING MACHINE

David E. Leonard, Orlando, Fla., assignor to American Machinery Corporation, Orlando, Fla., a corporation of Florida

Application February 10, 1947, Serial No. 727,650

19 Claims. (Cl. 62—104)

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This invention relates to a machine for cooling canned produce immediately after it has been packed and sealed.

In packing plants that process produce in cans or jars it is desirable to cool the containers and their contents immediately after they have been sealed so that the containers can be packed in shipping cases without danger of scorching the contents. It is customary to transfer the containers from a sealing machine to a cooling machine which reduces the temperature of the containers and their contents to the neighborhood of room temperature, after which the cans are labeled and packed in shipping cases.

The conventional can cooling machine comprises a belt upon which the cans may roll, a conveyor immediately above the belt for moving the cans along its length, can guides, such as pipes or angle irons, positioned above the conveyor to direct the cans in rows, and a device for spraying or dripping water onto the cans to cool the surfaces thereof. The belt is driven at a faster speed than the conveyor so that the cans will be caused to revolve rapidly to agitate their contents into contact with the cooled can walls. These machines are usually custom-built at the packing plant because they must necessarily have a considerable length to provide the required treatment for producing the desired cooling effect.

Heretofore, the processors have been restricted in the use of these cooling machines to the treatment of one type of produce and it has been necessary to duplicate the machines to properly cool cans of other types of produce. For instance, where the can cooler is used exclusively on citrus or similar free-flowing juices, it is comparatively simple to determine the requirements of a machine for obtaining maximum efficiency under a fairly stable density of fluid and with a fairly constant water temperature. To build an efficient machine capable of cooling hot cans containing citrus juices, apple juices, tomato juices, canned tomatoes, corn or applesauce, is an entirely different matter, however, as the power to so stir the contents as to successively expose the contents to the can or jar walls being cooled requires a flexibility in the machine that has heretofore been lacking.

The varying density of different types of produce contents requires the ability to change the speed with which the can is turned in order to bring all of the contents into contact with the can walls. The size of the can is another important factor, as a large can takes a longer

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time to cool than the small one and requires more water cooling action. There is also the problem of water temperature and water supply, particularly in certain climates and in the warmer seasons. The amount of cold water required can be reduced if the maximum amount of heat transfer from the cans to the water can be obtained. It has been found that this desired maximum efficiency may be attained by collecting, recirculating and reapplying an appreciable amount of used water which has been subjected to the least heat transfer action.

There is also the problem of the most efficient method of applying the water to the can in order to obtain the maximum heat transfer. Pressure sprays would appear to break down the clinging of the water to the can through surface tension, but the rapid application and removal of the water does not gain the maximum heat transfer that is obtainable from a given amount of water. It has been ascertained that dropping water in streams or large drops and rolling the can in a shallow depth of water results in more efficient cooling. To obtain this dropping effect, the water is flowed along a perforated pan that permits the water to run or drip through the perforations in small streams or large drops.

In order to eliminate an excessive use of water through a perforated pan, the holes in the pan must be held to a comparatively small size. However, the small size of the holes creates another problem as the holes tend to clog because of rusting of their edges and the clinging thereto of minute water-borne matter, thereby requiring frequent cleaning and reopening. After experimenting with various sizes and types of holes it has been found that a semicircular opening formed by angularly depressing a semicircular lip or tongue that is directed upstream with respect to the flow of water is practically ideal, as water flowing over this opening carries substantially all sediment past the opening and, consequently, the tendency to clog is eliminated.

Although the use of a perforated pan with the proper type of perforations provides the best method of application of the water to the cans, it is important that the feeding of the water onto the pan be properly controlled to spread an even dropping of water. The pan must be at a proper level or angle and the feed from the supply pipe must be such as to produce an accurate spread of the water over the perforated pan. It has been the practice to simply flow the water from a single supply nozzle onto the pan, but this arrangement fails to provide the necessary spread of the water. Accordingly, in the present instance, the pan is adjustably mounted so that it may be accurately levelled to the proper degree and the water is fed in both directions and from laterally-spaced nozzles located along the length of the pan so that the jets being thrown from opposite directions counteract each other's force.

The use of a perforated pan for spraying the water does not necessarily obtain maximum cooling efficiency, however, as the water that passes through the perforations falls perpendicularly onto the outer circumferential surfaces of the can and little or no water is applied to the ends of the cans. This difficulty has been overcome by forming the can guides of vertically-positioned, elongated strips extending longitudinally of the line of can travel and having outwardly flared or angular surfaces along or adjacent their bottom edges. The falling water is deflected against the can ends by the flared surfaces whereas water splashing from the cans is thrown back against the can ends by the vertical surfaces.

Having in mind the defects of the prior art apparatus, it is an object of this invention to provide a can cooling machine that may be commercially prefabricated, that is flexible in its construction and use and has adjustability as to the size of the machine and as to the arrangement of the machine to accommodate different can sizes, types of produce and times and speeds of treatment. It is another object of the invention to obtain maximum heat transfer efficiency from a given amount of water by collecting, recirculating and respraying an appreciable amount of used water which has been subjected to the least heat transfer action. It is still another object of the invention to supply and apply the cooling water so as to obtain maximum heat transfer from the can to the water. It is contemplated that the machine will comprise a unique construction that permits an economy of materials and parts and accomplishes superior operating results.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings wherein like reference characters indicate like parts throughout and in which:

Fig. 1 is a diagrammatic side view in elevation of the basic working elements of a can cooling machine;

Fig. 2 is a side view in elevation of a complete machine incorporating the present invention;

Figs. 3, 4 and 5 are side views in elevation of individual sections of the machine shown in Fig. 2;

Fig. 6 is a fragmentary side view in elevation of a constant drive mechanism for the machine;

Fig. 7 is a side view in elevation of a variable drive mechanism for the machine;

Fig. 8 is an end view in elevation of the drive end of the machine;

Fig. 9 is a cross sectional view taken on line 9—9 of Fig. 7;

Fig. 10 is a fragmentary cross sectional view taken longitudinally through the body of the machine;

Fig. 11 is a cross sectional view taken transversely through the body of the machine on lines 11—11 of Fig. 2 and Fig. 5;

Fig. 12 is a cross sectional view taken on line 12—12 of Fig. 11 and showing a plan of the bottom of the body of the machine above the recirculating tank;

Fig. 13 is a top plan view of the belt-supporting grating;

Fig. 14 is a side view in elevation of the grating shown in Fig. 13;

Fig. 15 is an enlarged fragmentary cross sectional view corresponding to a portion of Fig. 11 and showing the ends of the gratings in elevation;

Fig. 16 is an end view in elevation of a drip pan hanger;

Fig. 17 is a side view in elevation of a drip pan hanger;

Fig. 18 is a fragmentary plan view of the bottom of a drip pan showing the preferred type of openings therein;

Fig. 19 is a cross sectional view taken on line 19—19 of Fig. 18;

Fig. 20 is a side view in elevation of the water distributing system and showing the drip pan in cross section; and

Fig. 21 is a view in perspective of the can supporting belt, conveyor and guide.

Referring specifically to the drawings, Fig. 1 illustrates, diagrammatically, the basic working features of the can cooling machine incorporating the present invention. The cans C are fed, on their sides, onto a belt **25** and moved thereover by a conveyor **26**. The belt **25** is moved rather rapidly and is preferably mounted at a slight incline, usually from one-half to one inch per foot. Due to the inertia of the cans C, they tend to spin in a fixed position on the belt **25** rather than to advance with it. The conveyor **26** may be of a conventional type comprising spaced, endless chains **27** that are connected periodically by rods **28**; but in this case, the rods **28** are spaced apart a considerably greater distance than the diameter of a can C, or of a plurality of cans, that may be disposed between two adjacent rods **28** as particularly shown in Figures 2 and 21. The chains **27** are positioned adjacent the edges of the belt **25** and slightly above the top run of the belt so that their connecting rods overlie the belt **25** to contact the cans C and advance them up the belt **25**. The conveyor **26** is driven at a lesser speed than the belt **25** so that the cans C are caused to spin even while they are being advanced in order that all of their contents will be agitated into contact with the can walls. Due to the differential action of the belt **25** and the conveyor **26** and the spacing of adjacent conveyor rods **28**, the cans C spin on the belt **25** and more-or-less float back and forth between the conveyor rods **28**. The reversing or to and fro movement in the floating action further agitates the can contents.

The cans are guided in one or more straight lines on the belt **25** by elongated longitudinally extending can guides **29** that hold the cans in a straight line as they are advanced along the belt **25**. In order to cool the cans C and their contents, water is dropped onto them as they spin and float on the belt **25** from a spray or drip pan **30** whose bottom surface is perforated with a large number of small holes that cause the water to drop on the cans C in small streams or large drops. The water is supplied to the pan **30** by a supply pipe **31** that has nozzles **32** located periodically along its length so as to maintain a shallow film of water over the entire surface of the pan in order that it will be fed to and dropped through all of the perforations in the bottom of the pan 30.

These elements are mounted in a machine that is shown more-or-less diagrammatically in Fig. 2 and which comprises a sump tank 35 having a discharge outlet 36, a drum 37 mounted in the tank 35 and for supporting the lower end of the belt 25, a frame 38 mounted on top of the tank 35, and through which a transverse can feeding belt 39 may pass and upon which may be mounted a can turn 40 and pairs of sprockets 41 and 42 for supporting the lower end of the conveyor chains 27. The cans C are normally fed in an upright position on the feed belt 39 and are turned to a horizontal position by the can turn 40, which may be of conventional design, and fed onto the lower end of the spinner belt 25. The sprockets 42 are positioned so as to locate the conveyor 26 beneath the can turn 40 but above the belt 25 so that its cross bars 28 will pick up the cans C as soon as they leave the can turn 40.

A trough 43 extends from the upper front end of the tank 35 and is surmounted by a framework 44. The spinner belt 25 and lower conveyor run of the conveyor 26 are positioned in the trough 43, whereas the can guides 29, drip pan 30 and water supply line 31 are supported within the framework 44. The trough 43 is supported by standards 45 at spaced intervals along its length and it is positioned at a slight upward incline to a supporting frame 50 upon which the belt and conveyor drives are also mounted. The belt 25 extends over the drum 51 that is driven by a belt or chain 52 from a motor 53. The spinner belt 25 extends beneath the drum 51 and over a pair of spaced rollers 62 and 63 and under an adjustable roller 64 for tightening the belt 25. The conveyor chains 27 extend over sprockets 54 and 55, the sprockets 54 being driven by a belt or chain 56 from a shaft 57 having a gear 58 mounted thereon and in mesh with a gear 59 that is mounted on a shaft 60 that is driven by a belt or chain 61 from the motor 53. When the cans C are conveyed along the length of the belt 25 to the end of the run at the drum 51 they may be discharged therefrom in any suitable manner, as by conventional can turn 65 that will deliver them in an upright position to a cross conveyor belt 66.

In order to provide the desired flexibility of construction and use, the present invention contemplates the construction of a machine that is formed in sections which may be prefabricated and shipped to the packing plant and then assembled. In order to facilitate the construction of the machine, it is preferred that the sections be composed of standard, uniform parts and have a standard length as, for instance, of twenty feet each. This type of construction will enable the produce processor to assemble a machine of the desired length to properly process certain types of canned produce and then insert or remove sections, as desired, to alter the machine in order to process other types of canned produce.

Accordingly, the machine illustrated in Fig. 2 is shown as comprising a front section 70, including the sump tank 35, a plurality of middle sections 71, a recirculating section 72 and the drive section 50. In order to illustrate these sections in greater detail, the front section 70 is shown in Fig. 3, a middle section 71 is shown in Fig. 4, a recirculating section 72 is shown in Fig. 5, and drive sections 50 are illustrated in Figs. 6, 7, 8 and 9. It will be seen from these drawings that, with certain exceptions, each of the sections comprises identical parts and of exactly the same dimensions. Of course, with respect to the front section 70, the trough 43, framework 44 and drip pan 30 are all somewhat shorter in length than their counterparts in a center section 71, in order to accommodate the length of the sump tank 35 while maintaining the same overall length for the section 70 as that of the other sections. In addition, the water supply line 31 of the section 70 is considerably shorter than in the other sections as there is sufficient flow of water down the length of the pan 30 to properly supply its lower end.

The adjoining ends of each of the sections are terminated in an outer frame 75, formed of angle irons or the like, and having outwardly extending flanges 76, as shown in Fig. 3, so that adjoining flanges 76 on abutting ends of the sections may be bolted together, as shown in Fig. 4. The supporting legs 45 may be provided with U-shaped channels 77 for receiving the downwardly extending flanges 76 across the bottom of the trough 43, and bolts or pins may be inserted through the channels 77 and flanges 76 to hold them rigidly together. These legs or standards 45 may be fabricated in predetermined heights in order to support the sections at predetermined angles. The elements of the sections, such as the trough 43, frames 44, drip pan 30, and the can guides 29, all terminate flush with the end frames 76. The water supply lines 31, while being of exactly the same length, terminate at 78, just short of one end of the section, and at 79, just beyond the other end of the section, so that their couplings 80 will be free of the end frames 75 and readily accessible for coupling or uncoupling.

The recirculating section 72 is substantially identical to the center section 71 with the exception that it is provided with a collecting tank 90 beneath the trough 43, a branch pipe 91 between the water line 31 and the tank 90, a valve 92 in the branch 91 and a valve 93 in the main water line 31 below the branch 91, a drain 94 from the tank 90 to a pump 95 and a supply connection 96 between the pump 95 and the main water line 31 below the shutoff valve 93, and a valve 97 in the line 96. This recirculating of the water is one of the advantageous features of the present invention. The cans C are quite hot when they are delivered to the spinner belt 25, but they and their contents are gradually cooled as they are spun and advanced up the incline of the belt by the water dropping from the pan 30 so that by the time they reach the upper end of the belt their temperature has been reduced to the neighborhood of room temperature or slightly thereabove.

Consequently, the fresh cold water that contacts the cooled cans C at the upper end of the belt 25, while absorbing heat from the cans, is not heated to a material degree because the cans have lost a considerable amount of their heat before coming into contact with this water. Therefore, this used water, although slightly heated, has not absorbed the maximum heat of which it is capable so that by reusing it at the lower end, or beginning of the machine, it can still remove a considerable amount of the heat from the cans which are just delivered to the belt and therefore at their hottest. The slightly heated reused water absorbs the most intense heat from the cans and reduces their temperature considerably so that the most efficient results are obtained from the fresh cold water when the cans are advanced to that point in the machine.

The recirculating section is so designed that it may be cut out and cold water only employed or a mixture of recirculated and fresh water supplied to the lower end of the machine. If all of the water is to be recirculated, the valve 93 in the main supply line 31 is closed and the valve 92 in the branch line 91 is also closed. The water that has been dropped through the pan 30 above the collecting tank 90 is collected in the trough 43 from which it flows into the collecting tank 90. The water in the tank 90 is then withdrawn through the drain 94 by the pump 95 and fed through the line 96 back into the main supply line 31 below the shutoff valve 93. On the other hand, it may be desirable to partially cool the used water that is collected in the tank 90 by adding a proportion of fresh water, in which event the valve 92 in the branch line 91 is opened while the shutoff valve 93 is kept closed. Likewise, the shutoff valve 93 may be at least partially opened to supply fresh water to mix in the lower main line 31 with recirculated water from the supply line 96. If, however, it is preferred to use fresh water exclusively, the shutoff valve 93 may be opened and the valves 92 and 97 both closed so that the water supply will run straight through the main line 31 and the used water, after filling the tank 90 will flow down the lower end of the trough 43 to the sump tank 35 from which it is discharged through the opening 42.

The machine shown in Fig. 2 is composed in sequence of a front section 70, an intermediate section 71, a recirculating section 72, two more intermediate sections 71 and the drive section or frame 50. This assembly provides a so-called one hundred foot machine, but it will be understood that more, or less, of the intermediate sections 71 may be employed and the recirculating section 72 may be omitted. Consequently, the processor may obtain a front section 70, a drive section 50 and then as many or as few of the intermediate sections 71 as are required to fill his needs and, if desired, one or more of the recirculating sections 72. Furthermore, the drive section 50 may comprise a constant drive arrangement, as illustrated in Fig. 2, wherein both the belt 25 and the conveyor 26 are driven from the same motor 53, as shown in greater detail in Fig. 6, or he may obtain a variable drive arrangement, as shown in detail in Figs. 7, 8 and 9.

As the mounting and driving of the belt 25 is substantially identical in both cases, it is shown in detail only in Fig. 7, whereas Fig. 6 is a fragmentary view showing only the conveyor drive which is identical to that shown in Fig. 2 except that it is shown in greater detail and illustrates an adjustable mounting for the sprockets 55 to facilitate the tightening or loosening of the chains 27 of the conveyor 26. The sprockets 55 are mounted on a shaft 100 which is supported by bearing blocks 101 that are mounted to slide between spaced rails 102 and are provided with threaded apertures to receive elongated bolts 103 that are seated in the end uprights 104 of the supporting frame 50. By turning the bolts 103, the bearing blocks 101 are threaded along the rails 102 to vary the position of the sprockets 55 and thereby take up the slack or relieve the tension of the conveyor chains 27. This feature of construction is identical in both types of drives.

As shown in greater detail in Fig. 7, the belt 25 is supported by the drum 51 that is mounted upon a shaft 110 which also supports a sprocket or pulley 111 that is drivingly engaged by the belt or chain 52. The belt then runs over the roller 62 which is mounted for adjustment in a horizontal direction by being journaled in bearing blocks 112 which is slidably supported between rails 113 and threadably engaged by a fixed bolt 114. From the roller 62 the belt runs over the roller 64 which is mounted for vertical adjustment by being journaled in bearing blocks 115 that are slidably mounted between upright rails 116 and threadably engaged by a vertically positioned bolt 117. In addition to the vertical adjustment, the roller 64 is depressed under tension by interposing springs 118 between the heads 119 of the bolts 117 and the supporting portions of the frame 115. The springs 118 tend to depress the bolts 117 and thereby draw the roller 64 against the loop of the belt 25. A modified can delivery is shown in Fig. 7 which comprises a ramp 65' adjacent the drum 51 and down which the cans C may roll onto a longitudinally extending conveyor belt 66'.

As previously stated, it is frequently advantageous to vary the relative speeds of the belt 25 and the conveyor 26 so as to increase or decrease the time and degree of treatment of the cans. Of course, this could be obtained by interposing a shiftable gear transmission between the motor 53 and the drive sprockets 54, but a simplified and less expensive construction is obtained by the use of a separate variable-speed motor for driving the conveyor 26. It is preferred that the belt 25 be driven at a more-or-less constant speed as it must be moved fast enough to cause the cans to spin and any speed over this minimum is relatively ineffective as far as agitating the can contents is concerned. Therefore, it is preferable to vary the speed of the movement of the cans along the belt while they are spinning.

The variable drive is shown in Fig. 7 wherein it may be seen that the sprockets 54 are driven by the chain 56 which in turn is driven by a sprocket 125 that is comounted with a sprocket 126 on a shaft 127, the sprocket 126 being driven by a chain 128 that is driven by a sprocket 129 mounted on a shaft 130 which also supports a sprocket 131 that is driven by a chain 132 which engages a sprocket 133 comounted on a shaft 134 with a fly wheel 135 that is driven by a belt 136 from the drive of a variable-speed motor 137. The motor 137 is slidably mounted and adjustably positioned by a threaded rod 138 to vary the tension of the belt 136. This type of drive is also preferred for use in very long machines where the conveyor may be subject to a considerable load because of the reduction through the intermediate sprockets and chains.

As previously stated, the detailed construction of the corelated parts of the various sections of the machine are identical. This is best illustrated by Figs. 10 and 11 which show a fragmentary, longitudinal cross section and a transverse cross section respectively. As may be seen from these figures, the trough 43 may be formed of sheet metal and its walls may be smooth with the exception of diagonally disposed ridges 140 formed upwardly in its bottom wall, as also shown in Fig. 12, to form a support for the lower return run of the belt 25 and to space the belt from the bottom wall of the trough to prevent undue friction between the belt and the bottom wall and also to prevent the possible adhering of the belt to the bottom wall.

Uprights 141 are fixed at spaced intervals to the opposed sidewalls of the trough 43 and these uprights are spaced by a plurality of cross braces extending therebetween. A short distance above the bottom wall of the trough 43, a cross brace 142, such as an angle iron, is arranged to support removable gratings 143 for supporting the upper run of the belt 25, and fixed longitudinal guides 144 formed of angle iron and which serve as dams along the edges of the belt 25 to build up a shallow depth of water on the belt in which the cans may roll. Slightly above the top of the trough 43 is a slotted cross brace 145, formed by two opposed angle irons, for supporting can guides 29. The slotted cross brace 145 permits adjustment of the can guides transversely of the machine to accommodate cans of different sizes or a different number of can runs. A cross brace 147 is spaced above the slotted brace 145 to support the spray pan 30, by means of hangers, and the main water supply line 31.

A top cross brace 148 forms a tie between the tops of the uprights 141 and also supports longitudinal channels 149 which form chain guides for the chains 27 of the conveyor 26. Chain guides 150 are fixed within the trough 43 to the uprights 141 a short distance above the bottom cross brace 142 so as to properly space the cross bars 28 of the conveyor 26 above the belt 25. The cross section shown in Fig. 11 is taken through the recirculating section but is identical in every respect to any other portion of the machine along its length except that the tank 90 is fixed to the bottom of the trough 43 and the bottom wall of the trough is provided with a series of openings 155 along its outer edges in the spaces between its side walls and the edges of the belt 25. By positioning the drain openings 155 in this manner, as also shown in Fig. 12, there is no danger of the belt overlapping them to partially close the openings or to create friction between the edges of the openings 155 and the belt 25.

The gratings 143 are preferably formed in two longitudinal sections so that they may be lifted from either side with the least amount of trouble to gain access to the lower run of the belt 25 and the bottom of the trough 43. These gratings 143 may also be conveniently formed in longitudinal sections that will span the distance only between two spaced cross supports 142. In order to properly position and anchor the gratings 143, the cross supports 142 are provided with longitudinally extending upstanding ridges 160 that form end abutments for the gratings, and in their centers the braces 142 may be provided with transversely extending plates 161 which will overlie the protruding ends 162 of laterally extending bars 163 fixed to the bottom inner corners of the gratings 143. The fixed plates 161 hold down the ends of the gratings 143 but only at their inner sides so as to permit the lifting of the outer sides when it is desired to gain access to the lower run of the belt 25 or the bottom of the trough 43.

In order to provide flexibility and adjustability of the drip pans 30 they may be supported by adjustable hangers 180, as best shown in Figs. 16 and 17. These hangers comprise U-shaped strips 181 adapted to receive and support the drip pan 30 or the ends thereof and which are nested within and fixed to a U bolt 182. The upwardly turned ends of the U bolt 182 may extend through

holes in the cross member 147 and be secured by nuts 183. Thus the pan 30 may be adjusted vertically by threading the nuts 183 along the ends of the bolts 182 and thereby permit the proper leveling or angulation of the drip pan 30 to obtain the desired spreading and flow of water therein and dropping therethrough. As previously stated, the buttoms of the drip pans 30 are usually perforated with a large number of small apertures but this has proved a disadvantage due to rusting and clogging by foreign matter in the water.

It has now been found that this may be overcome by forming the perforations in a semicircular shape and by only partially opening them, as best shown in Figs. 18 and 19. The perforations 185 are formed by punching only one side of a round hole and depressing a lip or tongue 186 at a very slight angle so that the holes 185 are not completely opened. The openings 187 formed in this manner are positioned upstream with respect to the flow of the water in the pan 30 so that the water will tend to flow over the edge 185 and up the tongue 186 and past the opening 187 so that it has to reverse its flow down the tongue 186 to pass through the openings 187. By this arrangement, any foreign matter in the water is carried past the opening 187 which is therefor kept open and does not become clogged.

It has been the custom to feed the water onto the drip pans 30 from a single nozzle and let the water flow where it may over the bottom of the pan, or supply a sufficient quantity of water to flood the pan. In the first instance, the water is not properly spread over the bottom of the pan and in the second instance, considerable waste is involved. To overcome this, the feed lines 32 from the supply line 31 are divided into laterally extending lines 190 that terminate in T sections 191 that are so positioned to throw jets in opposite directions longitudinally of the drip pan 30, as best shown in Figs. 11 and 20. Each of the feed lines 32 may be provided with a valve 192 for controlling the volume of water fed through the nozzles 193. By this arrangement, jets of water J and J' are thrown in both directions and on both sides of the pan 30 so that the water is evenly fed over the bottom of the pan 30. It would appear that the jets J which are thrown upstream would tend to cause the water to back up and flow directly into the openings 187, but this action is overcome by the opposed downstream jets J' which counteract the force of the upstream jets J and cause the water to spread out evenly over the surface of the pan.

When the cooling water is dropped straight down onto the cans from the pan 30, there is very little of it that contacts the ends of the cans and, consequently, the cooling action is somewhat retarded. In accordance with the present invention, as best shown in Fig. 21, this difficulty is overcome by the provision of can guides 29 which have longitudinally extending vertically positioned web portions 170 providing vertical walls 171 which are terminated at or near their lower edges in flared or angularly positioned surfaces 172. The web portion 170 provides a vertical wall 171 by which water splashing from the cans will be thrown back against the ends of the cans. Water falling vertically will be deflected by the flared or angularly positioned surfaces 172 against the ends of the cans. In actual practice, the can guides 29 are composed of elongated strips that form the web portions 170 and square bars 173 are secured, at one of their corners, to the lower edge of the strips 170 so that the two upper sides of the bars 173 form the flared angular surfaces 171. The bars 173 also reinforce the strips 172 and prevent their flexing in a longitudinal direction. It will be understood, of course, that the bars may be of other shapes as long as they provide the flared surfaces or, for the matter, the flared surfaces may be formed in other manners.

The strips 172 have a series of vertically positioned bolts 173 secured in spaced relation along their top edges, which bolts may extend through the slots in the cross members 145 to act as hangers for positioning the can guides 29. By this arrangement, the can guides 29 may be adjusted vertically by threading the nuts 174 along the bolts 173 and they may be adjusted transversely of the machine by sliding the bolts 173 along the slots in the cross members 145. Lock nuts 175 may be threaded on the bolts 173 beneath the cross members 145 to clamp the bolts 173 firmly in position. In order to support the abutting ends of two longitudinally aligned can guides 29, a hanger bolt 173' may be secured to an inverted channel member 176 which is adapted to straddle and be joined to the abutting ends of the guide strips 172 by bolts 177 extending through each end of the channel member 176 and through the end of the respective guide strip 172.

In view of the foregoing description, it will be seen that the cooling water will be dropped evenly from the entire width of the pan 30 onto the cans C. The major portion of this water will fall directly upon the spinning sides of the cans but a portion will be deflected and splashed onto the ends of the cans. While only a center guide 29 is shown in Fig. 21, it will be understood that guides 29 will be positioned along the outsides of the can rows, as shown in Fig. 11. The cooling of the ends of the cans increases the efficiency of the cooling action by ten to fifteen per cent. In addition to the dropping of water on the cans, they are cooled by spinning in a shallow flow of water that is retained on the spinner belt 25 by the dams or guides 144. As best shown in Fig. 21, the dams 144 extend a short distance above the surface of the spinner belt 25 and they are positioned so as to substantially abut or contact the edges of the belt to preclude excessive drainage therebetween and to retain the water in a shallow layer on the belt. Thus, the cans are cooled by the dropping water and also by spinning in a shallow depth of water.

Although certain specific embodiments of the invention have been shown and described, it is obvious that many modifications thereof are possible. The invention therefore is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

That which is claimed as new is:

1. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate the contents thereof into contact with the container walls, and a spray pan above said conveyor and having holes in the bottom thereof for dropping water onto the containers to cool their walls and contents, the holes in said spray pan being small and formed by the depression of lips to create openings below the surface of the pan with their edges directed upstream of the flow of water in said pan so that water-borne matter will flow over said openings and thereby preclude their becoming clogged.

2. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate the contents thereof into contact with the container walls, and a spray pan above said conveyor and having holes in the bottom thereof for dropping water onto the containers to cool their walls and contents, the holes in said spray pan being small and formed by the depression of semicircular lips to create openings below the surface of the pan that are semicircular in form with their convex edges directed upstream of the flow of water in said pan so that water-borne matter will flow around and over said openings and thereby preclude their becoming clogged.

3. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate the contents thereof into contact with the container walls, a spray pan above said conveyor and having holes in the bottom thereof for dropping water onto the containers to cool their walls and contents, and a water supply system mounted above said pan and including a plurality of transversely spaced nozzles, each of which is arranged to discharge water in opposite directions longitudinally of said pan, sets of said transversely spaced nozzles being spaced longitudinally along said pan so that the jets from said nozzles are in opposed relation to neutralize each other's force and maintain an even depth of water over the entire area of said pan.

4. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto the containers to cool their walls and contents, and guides extending longitudinally of said conveyor and for guiding said containers in rows, said guides having vertical surfaces adjacent the upper portions of and above said containers to deflect splashed water onto the ends of said containers and having flared or angular surfaces below the tops of said containers to deflect falling water onto the ends of said containers to cool the container ends and thereby expedite the cooling of their contents.

5. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto the containers to cool their walls and contents, and guides extending longitudinally of said conveyor and for guiding said containers in rows, each of said guides including a vertical web portion providing vertical surfaces adjacent the upper portions of and above said containers to reflect splashed water onto the ends of said containers and bars secured to the bottom of said web to brace said web and providing flared or angular surfaces below the tops of said containers to deflect falling water onto the ends of said containers to cool the container ends and thereby expedite the cooling of their contents.

6. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto said containers to cool their walls and contents, support members positioned above said conveyor, guides extending longitudinally of said conveyor and for guiding said containers

in rows, and hangers fixed to said guides and adapted to be releasably and adjustably clamped to said support members to space said guides from said conveyor, said support members extending transversely of said conveyor to permit the spacing of said guides relative to each other to vary the width and number of container rows in accordance with the size of the containers being cooled.

7. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto said containers to cool their walls and contents, support members positioned above said conveyor, guides extending longitudinally of said conveyor and for guiding said containers in rows, and threaded hangers fixed to said guides and adapted to be releasably and adjustably bolted to said support members to space said guides from said conveyor, said support members having slots to receive said hangers and extending transversely of said conveyor to permit the spacing of said guides relative to each other to vary the width and number of container rows in accordance with the size of the containers being cooled.

8. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate the contents thereof into contact with the container walls, support members positioned above said conveyor, a spray or drip pan which is U-shaped in cross section and has small holes in the bottom thereof to permit the dropping of water therethrough, and hangers being suspended from said support members and supporting said drip pan above said conveyor so that the water dropped thereby falls onto the containers on said conveyor, said hangers including U-shaped brackets adapted to removably receive said pan or abutting ends of adjoining pans and also including vertically extending threaded members on opposite sides of said brackets and for adjustably bolting to said support members so that said pan may be hung at predetermined levels along the length thereof.

9. A machine for cooling newly-packed containers of produce and which comprises a conveyor for spinning the containers as they are transported thereby to agitate the contents thereof into contact with the container walls, support members positioned above said conveyor, a spray or drip pan which is U-shaped in cross section and has small holes in the bottom thereof to permit the dropping of water therethrough, and hangers being suspended from said support members and supporting said drip pan above said conveyor so that the water dropped thereby falls onto the containers on said conveyor, said hangers including U-shaped brackets adapted to removably receive said pan or abutting ends of adjoining pans, said brackets being nested within U bolts which may be adjustably bolted to said support members so that said pan may be hung at predetermined levels along the length thereof.

10. A machine for cooling newly-packed containers of produce and which comprises a conveyor including a belt for supporting and spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto said containers to cool their walls and contents, and vertically extending guides positioned on either side of said belt and substantially in contact with its edges to prevent water from passing freely therebetween and to retain a shallow depth of water on said belt and in contact with said containers.

11. A machine for cooling newly-packed containers of produce and which comprises a conveyor including a belt for supporting and spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof while water is dropped onto said containers to cool their walls and contents, a plurality of transversely extending support members spaced longitudinally beneath said belt, longitudinally divided panels extending between and mounted on said support members and for supporting said belt in a plane, small elongated plates centrally mounted transversely of said support members, and bars fixed to the undersides and extending laterally from the inner corners of said panels to underlie said plates and anchor said panels while permitting the outer sides of said panels to be lifted to gain access to the area beneath said belt.

12. A machine for cooling newly-packed containers of produce and which comprises an endless conveyor for spinning the containers as they are transported thereby to agitate their contents into contact with the walls thereof, said conveyor being mounted in a trough with its lower return run supported by the bottom of said trough, a water supply above said conveyor for dropping water onto the containers to cool their walls and contents, said water being collected by said trough, a tank beneath said trough and in communication therewith by means of apertures in the bottom of said trough and adjacent the sides thereof beyond the edges of said lower conveyor run, said tank being spaced from the discharge end of the machine so that the water collected therein is only partially heated from contact with containers that are at least partially cooled, and a recirculating system in cooperative relationship with said tank for supplying at least a part of the collected water to the receiving end of the machine for dropping on newly-supplied and relatively uncooled containers.

13. A machine for cooling newly-packed containers of produce and which comprises a belt for supporting a row of rollable containers on their sides, a water system for dropping water upon the containers on said belt, a conveyor above said belt for rolling said containers along said belt, a power system for driving said belt at a speed that causes said containers to spin on said belt and thereby agitate their contents into contact with the walls thereof, and a variable power system for driving said conveyor at a variably-controlled speed less than that of the belt to vary the rate of advance of said containers and control the degree of cooling treatment received by them from the water.

14. A machine for cooling newly-packed rollable containers of produce and which comprises a belt mounted at a slight incline and for supporting a row of rollable containers on their sides, a water system for dropping water on the containers on said belt, a conveyor above said belt for rolling said containers along said belt and up the incline thereof and having spaced container confining openings to receive said containers therein and each of considerably greater length longitudinally of the conveyor than the diameters of the containers confined therein, a power system for driving said belt at a speed,

in conjunction with said incline, that causes said containers to spin on said belt and to move to and fro within the confines of said openings while being advanced by said conveyor thereby agitating the contents of the containers into contact with the walls thereof, and a variable power system for driving said conveyor at a variably-controlled speed less than that of said belt to vary the rate of advance of said containers and control the degree of cooling treatment received by them from the water.

15. A machine for cooling newly-packed containers of produce and which comprises an elongated trough, a frame mounted above said trough, panels mounted horizontally in said trough and adapted to support a belt for supporting a plurality of containers in rows, chain guides mounted on either side of said trough and above said panels for supporting the chains of an endless conveyor for advancing the containers along the belt, chain guides on top of said frame for guiding the return run of said conveyor, can guides supported by said frame above the path of the conveyor and longitudinally thereof to guide the containers in rows on the belt, a spray pan supported by said frame above said can guides to drop water on the containers, a water supply system mounted on said frame for supplying water to said spray pan, a sump tank at one end of the machine and in communication with said trough, and a drive system at the other end of the machine for driving the belt and the conveyor, said machine being composed of a plurality of longitudinal sections each of which is of a predetermined length and of substantially identical construction with the exception of the end sections which include the sump tank and drive systems respectively, said sections having flanges at their ends that are adapted to be removably secured together to form a unitary structure and which permits the assembly of a machine of variable length.

16. A machine for cooling newly-packed containers of produce and which comprises an elongated trough, a frame mounted above said trough, panels mounted horizontally in said trough and adapted to support a belt for supporting a plurality of containers in rows, belt guides mounted in said trough alongside of said panels to guide the belt, chain guides mounted on either side of said trough and above said panels for supporting the chains of an endless conveyor for advancing the containers along the belt, chain guides on top of said frame for guiding the return run of said conveyor, can guides supported by said frame above the path of the conveyor and longitudinally thereof to guide the containers in rows on the belt, a spray pan supported by said frame above said can guides to drop water on the containers, a water supply system mounted on said frame for supplying water to said spray pan, a sump tank at one end of the machine and in communication with said trough, a drive system at the other end of the machine for driving the belt and the conveyor, said machine being composed of a plurality of

longitudinal sections each of which are of a predetermined equal length and of substantially identical construction with the exception of the end sections which include the sump tank and drive systems respectively, said sections having flanges at their ends that are adapted to be removably secured together to form a unitary structure and which permits the assembly of a machine of variable length, and members for supporting said machine at the junction points of said sections and adapted to removably receive the flanges of adjoining sections, said members having variable and predetermined heights so that they may be positioned to support said machine at a predetermined angle.

17. The method of cooling newly-packed containers of produce which comprises directing water in small streams or large drops onto both the ends and sides of said containers while spinning said containers in a shallow depth of water to agitate their contents into contact with the cooled container walls.

18. In a machine for conveying cylindrical cans, a belt upon which the cans are placed where their sides are in contacting relation therewith, means for moving the belt longitudinally of its length, a conveyor overlying the belt in the plane of the cans on the belt and having spaced portions between which one or more of the cans may be confined and of considerably greater distance apart than the diameters of the cans received therebetween so that the cans may move to and fro between said spaced portions, and means for moving said conveyor at relatively lower speeds than said belt whereby the cans are caused to spin upon their axes and move to and fro while being advanced through said conveying machine.

19. In a machine for conveying rollable objects, a belt upon which the objects are placed in rollable contacting relation therewith, means moving said belt longitudinally of its length, a conveyor overlying the belt, means for actuating said conveyor at a speed less than that of said belt, said conveyor having means contacting said objects to advance them along the belt in the direction of the movement of the belt while being spun by said belt, said object contacting means on the conveyor being positioned to allow the object to move back and forth relative to the conveyor while being advanced through said conveying machine.

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Disclaimer

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Hereby enter this disclaimer to claims 10, 13, 14, 18, and 19 of said patent.

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