July 20, 1965 A. W. FRENCH 3,195,446

PROCESS FOR RECOVERY OF JUICE FROM SUCROSE BEARING MATERIALS

Original Filed July 9, 1957 4 Sheets-Sheet 1

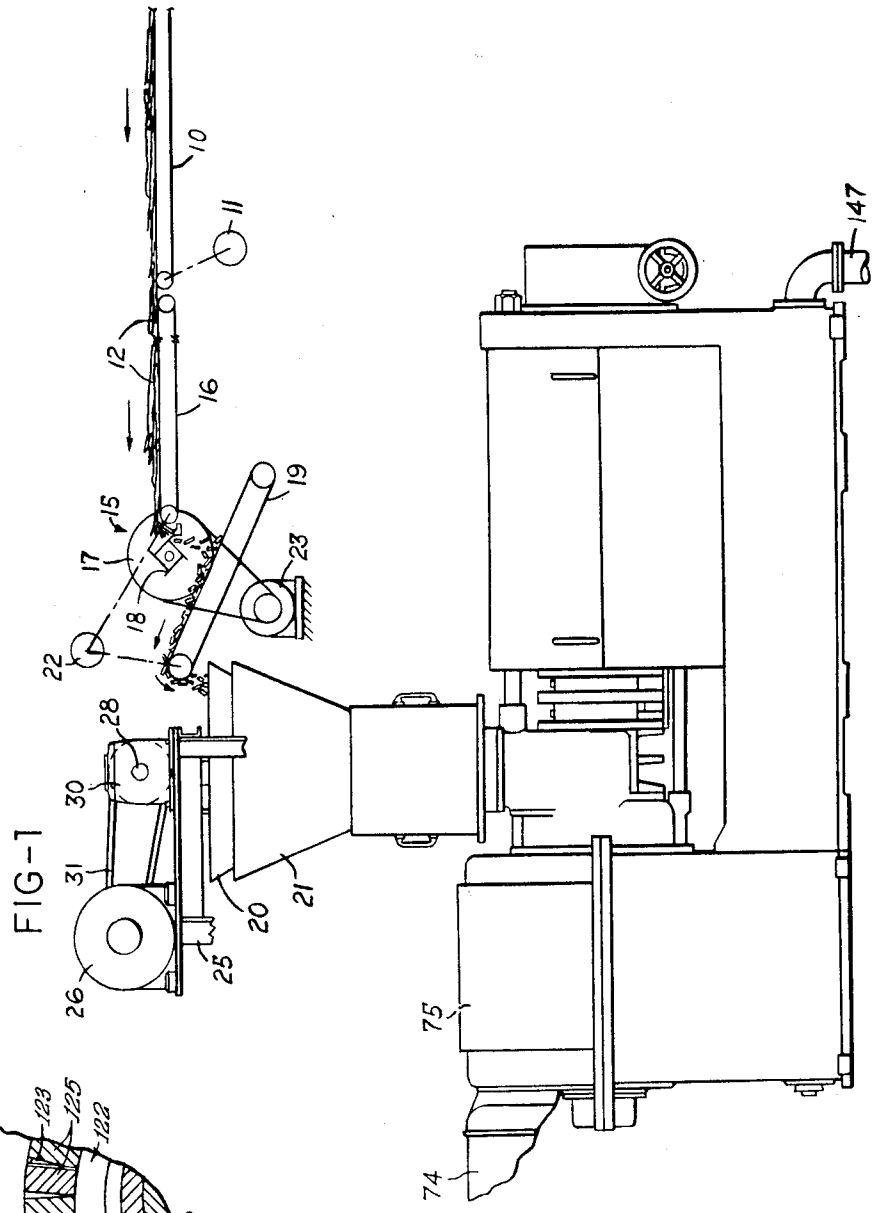


FIG-1

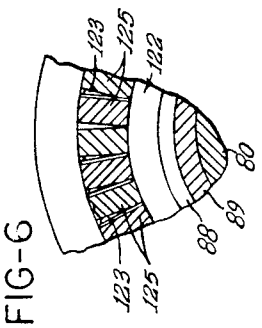


FIG-6

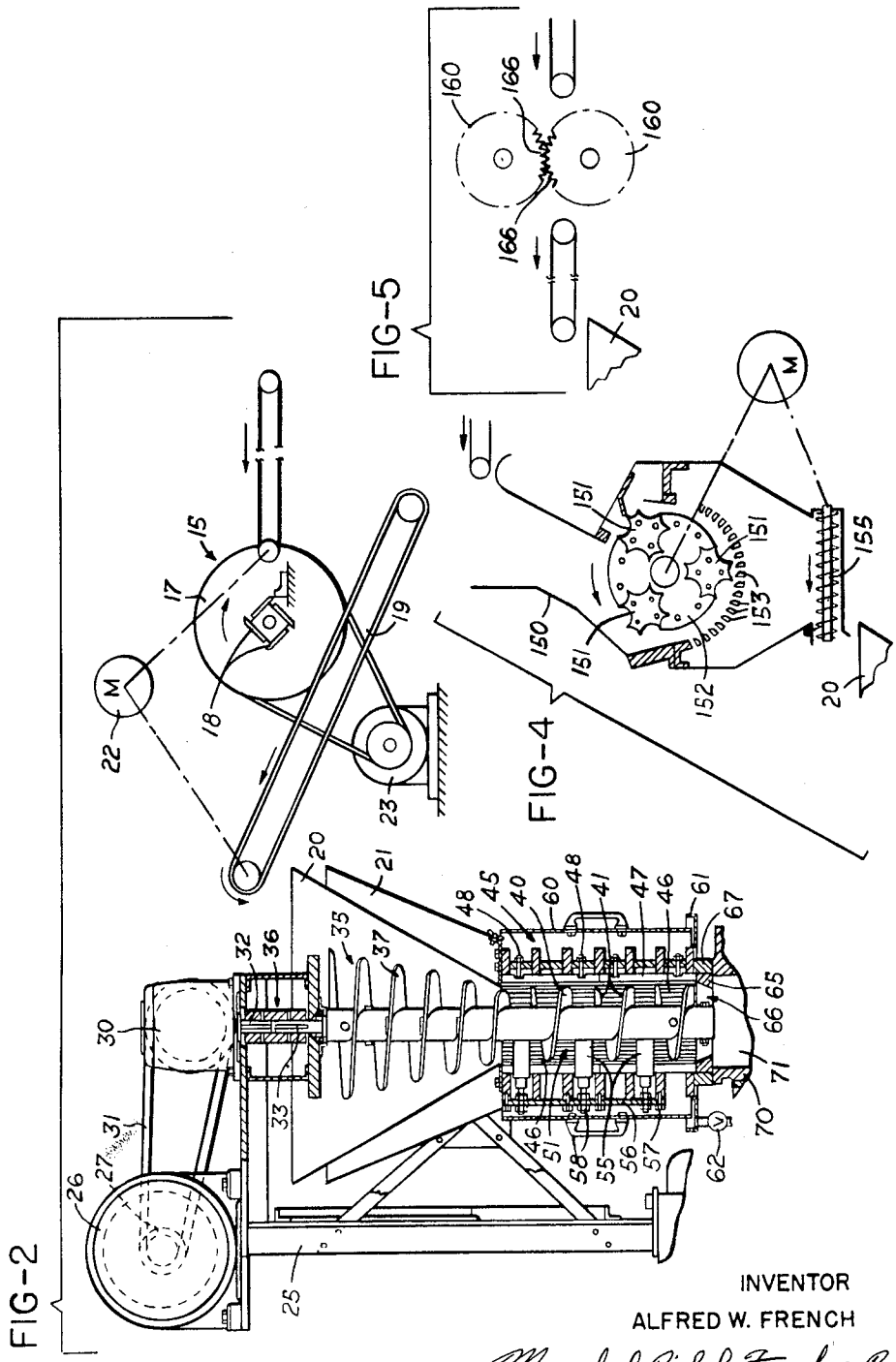
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PROCESS FOR RECOVERY OF JUICE FROM SUCROSE BEARING MATERIALS

Original Filed July 9, 1957 4 Sheets-Sheet 2



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PROCESS FOR RECOVERY OF JUICE FROM SUCROSE BEARING MATERIALS

Original Filed July 9, 1957 4 Sheets-Sheet 3

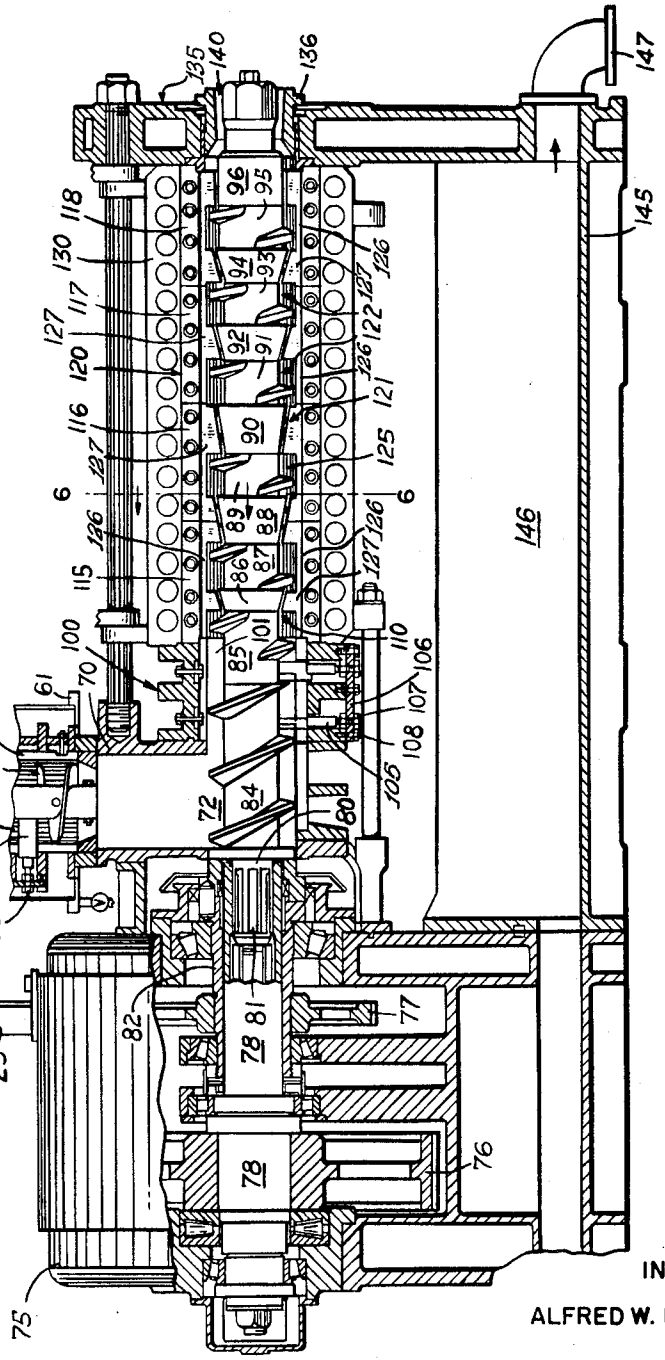


FIG-3

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PROCESS FOR RECOVERY OF JUICE FROM SUCROSE BEARING MATERIALS

Original Filed July 9, 1957 4 Sheets-Sheet 4

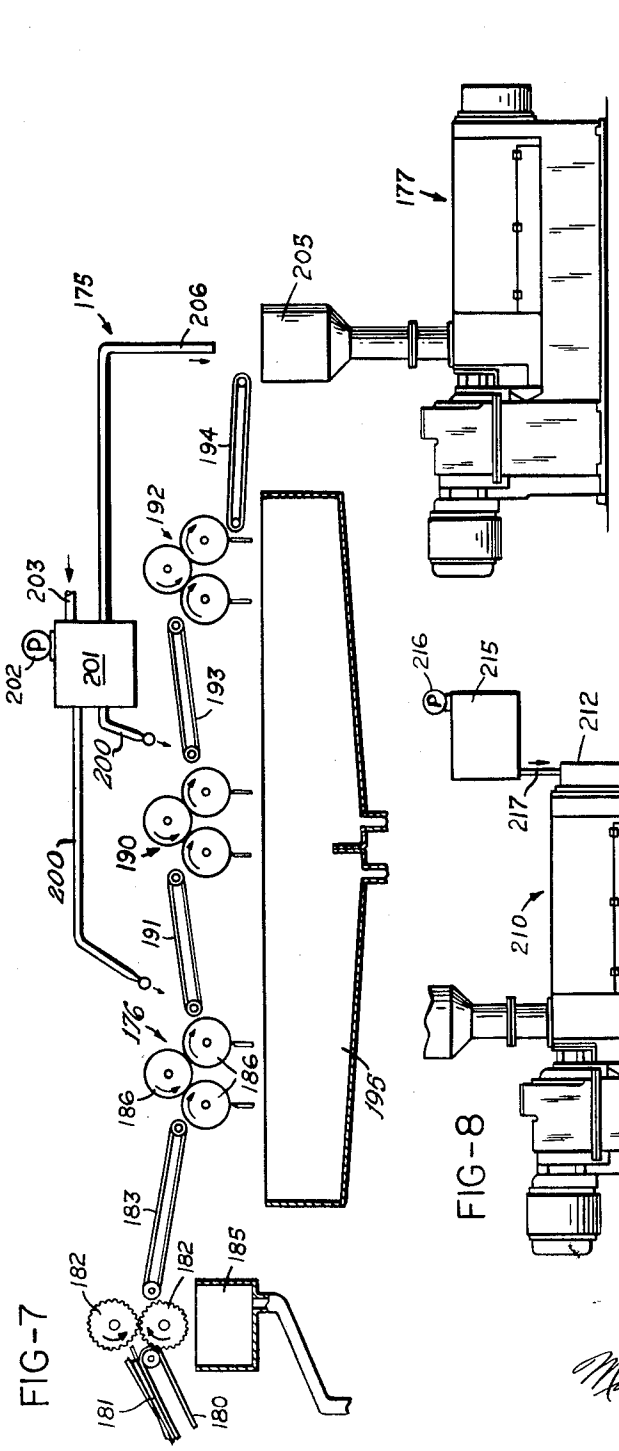


FIG-7

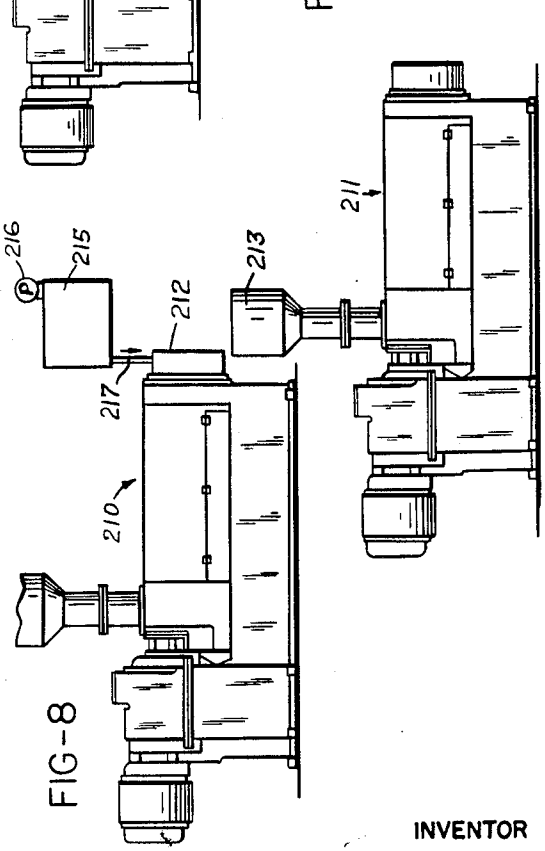


FIG-8

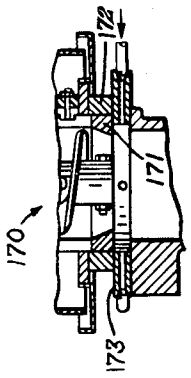


FIG-9

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United States Patent Office 3,195,446 Patented July 20, 1965

3,195,446

PROCESS FOR RECOVERY OF JUICE FROM SUCROSE BEARING MATERIALS

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Original application July 9, 1957, Ser. No. 670,743, now Patent No. 3,086,452, dated Apr. 23, 1963. Divided and this application Nov. 30, 1962, Ser. No. 241,399

9 Claims. (Cl. 100—37)

This application is a division of copending application Serial No. 670,743 filed July 9, 1957, now Patent No. 3,086,452 issued April 23, 1963.

A primary object of this invention is the provision of a process for expressing juice from sugar cane in which a high percentage of the cane juice is expressed from the cane through the substantially continuous application of high mechanical pressure, and in which the bagasse fiber is discharged with a low retained moisture content.

Another object of this invention is to provide a process for expressing juice from sugar cane in which the cane is defibered and the fibers mixed under sustained pressure to contribute to further expression of juice.

Another object of this invention is the provision of a process for expressing juice from sugar cane in which the cane is frictionally heated during its movement through the expressing apparatus while under a high mechanical pressure to promote further removal of the juice from the cells.

Another object of this invention is the provision of a process for recovering high percentage of the sucrose content of sugar cane through the use of a maceration fluid intermediate expressing stages.

Other objects and advantages of the present invention will be apparent from the following description, the accompanying drawings and the appended calims.

In the drawings—

FIG. 1 is a somewhat schematic side elevation of apparatus used to carry out the present process;

FIG. 2 is a sectional side elevation of that portion of the apparatus which is used to prepare the cane for its primary juice expressing operation;

FIG. 3 is an in part sectional and in part full side elevation of a press used in conjunction with the cane preparing means of FIG. 2 to express juice from sugar cane;

FIG. 4 is a sectional side elevational view showing shredding means for cutting raw cane to suitable lengths;

FIG. 5 shows schematically the application of crushing rolls to prepare raw cane for entry into the expressing apparatus;

FIG. 6 is a fragmentary sectional view taken substantially along the line 6—6 of FIG. 3 and showing the screen bar cage structure;

FIG. 7 is a schematic elevation of a roll type expressing mill with an interrupted flight screw press positioned at the discharge end to receive bagasse and express additional fluid therefrom;

FIG. 8 is a schematic side elevation of two interrupted flight screw type expressing presses arranged in series with maceration fluid added between two presses; and

FIG. 9 is a slightly enlarged fragmentary showing of the restricting orifice of FIG. 3 with a manifold for adding maceration fluid to the fibrous material as it passes through the orifice.

Successful commercial recovery of the sucrose found in sugar cane juice depends upon expression of the cane juice from the cane within the reasonably limited period of time when the percentage of sucrose present is at a maximum. Sugar cane, in some cases, decreases in sucrose content if permitted to stand in the field and overripen. On the other hand, if the cane is cut and not

processed within a short time the sucrose content will further decrease due to partial inversion thereof. Thus, due to the critical nature of the time period within which the cane must be worked to obtain the maximum sucrose recovery, can mills are normally constructed to handle relatively large quantities of raw cane within a short period of time. Naturally any time the mill is forced to shut down to make repairs because of mechanical failures, valuable sucrose may be lost and the recovery operation become less efficient.

Present sugar cane processing factories, utilizing roller-type mills to effect crushing of the cane to express the juice therefrom, normally use sizeable quantities of maceration water intermediate successive crushing stages to achieve efficient recovery of the sucrose content.

The present invention, in many instances, makes possible the recovery of sucrose percentages approximately equivalent to those now obtained without the use of maceration or lixiviating liquids, as well as reducing the chances of sucrose loss occurring from interrupted mill operations in factories where one piece of machinery depends upon another. The present process and apparatus are also capable of utilizing maceration fluids in those instances where it is either desired or preferred. Since the present apparatus effects expression of the juice independently of any other apparatus, when a plurality of such devices are used they may be arranged to operate in parallel to handle the entire amount of cane being processed by the mill and the breakdown of one piece of apparatus will in no way affect the independent functioning of those remaining.

While the present invention will be hereinafter described with particular reference to the treatment of sugar cane, it also provides substantial advantages in handling other sucrose bearing fibrous material such as, for example, sugar beets and sorghum. Related apparatus and method for specific application in recovering increased quantities of sucrose from sugar cane, and more particularly from the trash or cush-cush fibers formed during the pressing operation, and otherwise improving the efficiency of existing extraction processes are described and claimed in copending application Serial No. 670,742 (now Patent No. 3,037,445) filed of even date with copending application Ser. No. 670,743 (now Patent No. 3,086,452) and assigned to the same assignee as the present application.

Referring now to the drawings which illustrate preferred embodiments of apparatus for effectuating the present process, a generally horizontally disposed conveyor (FIG. 1), driven by a motor 11, is provided for transportation of raw cane 12 into a cane chopper 15 where a feeding conveyor belt 16 can advance it into a rotary cutting mechanism 17 having a plurality of cutting blades 18 arranged around the periphery thereof. An upwardly inclined conveyor 19 positioned below blades 18 receives the chopped cane and dumps it into a cone-shaped hopper 20 which is protected by a cone cover 21. Conveyors 16 and 19 are driven by the motor 22 illustrated diagrammatically in FIG. 1, while cutting mechanism 17 is driven by motor 23.

Frame work 25 provides support for hopper 20 and also for a driving motor 26 which has its pulley 27 (FIG. 2) connected to the input shaft 28 of a gear box 30 by means of a belt 31. The output shaft 32 (FIG. 2) of the gear box is operatively joined to the shaft 33 of a screw conveyor 35 through the connecting spline 36. The upper portion of shaft 33 carries a continuous feeding vane 37 to move cane from hopper 20, while that portion of shaft 33 extending beyond the lower limit of hopper 20 carries a series of interrupted feeding vane flights 40 which have spaces 41 between the adjacent ends of successive flights.

A vertically disposed expression cage **45** surrounds the interrupted vane flights **40** of screw conveyor **35** and includes a plurality of vertically disposed, radially spaced screen bars **46** (FIG. 2), which are held in place by wedge bars **47**, the wedge bars being adjustably secured to cage **45** by threaded fasteners **48**. Screen bars **46** are spaced slightly apart to define fluid drainage openings between adjacent bars so that expressed juice can flow outwardly away from an expression chamber **51** formed by the bars. Extending through the screen bars **46** into the chamber **51** are a number of breaker bars **55** which are adjustably secured to force feed cage **45**, through holding strip **56**, as by bolts **57**. The adjustable fasteners **58** on the outer ends of the breaker bars provide means for adjusting them radially into or out of the chamber **51** within the vertical spaces **41** between interrupted vanes **40** to stop rotary movement of the cane in the chamber and cause it to move axially downwardly therethrough.

Expression cage **45** is enclosed within an imperforate wall **60** which receives the expressed juice and directs it downwardly into a collecting trough **61** adjacent the lower end of the cage structure where the juice can be withdrawn through outlet valve **62** to any suitable collection receptacle.

A ring-like split cone **65**, positioned adjacent the lower end of expression cage **45**, has a tapered inner surface defining a restricting orifice **66** of less diameter than the diameter of chamber **51**. A clamping ring **67** of slightly greater height than split ring **65** surrounds the split ring to hold it together and in operating position. Beneath restricting orifice **66** a vertically extending wall **70** defines a further chamber **71**, of greater diameter than the orifice, where the cane is permitted to expand as it drops into press inlet chamber **72** (FIG. 3). Such collar arrangement is described and claimed in more detail in copending application Serial No. 645,165 filed March 11, 1957, now Patent No. 3,067,672, and assigned to the same assignee as the present application.

A suitable drive motor **74**, part of which is shown in FIG. 1, is mounted on a gear housing **75**. Housing **75**, containing a pair of driven gears **76** and **77** (FIG. 3), is mounted adjacent the wall **70**, with gear **76** operably connected through a driving sleeve **78** to a longitudinally extending shaft **80**, as by spline connection **81**, and gear **77** operably connected through a sleeve **82** and dog **83** to a feed screw **84** which surrounds a portion of shaft **80** and extends longitudinally through inlet chamber **72**. Gears **76** and **77** are driven through a suitable connection with motor **74**, with gear **77** preferably being operable at a higher speed than gear **76** so that feed screw **84** may be rotated faster than shaft **80**. Following feed screw **84** a plurality of alternately arranged screw flights **85**, **87**, **89**, **91**, **93** and **95** and pressure collars **86**, **88**, **90**, **92** and **94** and a final discharge collar **96** are all keyed or otherwise suitably attached to the shaft **80** for rotation therewith.

A preliminary expression cage **100** begins at vertically extending wall **70** and surrounds a portion of feed worm **84** and screw flight **85** to define a preliminary expression zone **101**. Cage **100** includes push-through-type breaker bars **105**, the breaker bars being adjustably secured to a holding strip **106** through adjustable fasteners **107**. Screws **108** are then used to mount the holding strip **106** to the cage proper.

At the termination of preliminary expression zone **101** there is an inlet opening to a main expression chamber **110**. A plurality of screen bar sections **115**, **116**, **117** and **118** make up an expression cage **120**, and the aforementioned alternately arranged screw flights and pressure collars are located inwardly thereof. The areas between the collars and the expression cage **120** define zones **121** where primarily compacting and expression occur while the areas between the worm flights and the cage **120** define zones **122** where primarily defibering occurs. Expression cage **120** includes screen bars **125** with drainage openings obtainable by means of spacers **123** and breaker bars **126**, which have a plurality of longitudinally and radially extending lugs **127** terminating just short of the outer surface of pressure collars **86**, **88**, **90**, **92** and **94** and discharge cone **96** to cause primary longitudinal movement of cane over these collars without the presence of excessive rotary motion. Reinforcing structure **130** is present to strengthen the screen bar sections since large radial forces are exerted against them when the press is operating.

Satisfactory results have been obtained, reducing the moisture content of sugar cane to as low as 30%, with a press having a cage inner diameter of 8½ inches and having case hardened steel pressure collars and screw flights of the following dimensions. Screw flights and pressure collars **92–95** inclusive have been omitted in this example.

Table 1

Screw Flights and Pressure Collars	85	86	87	88	89	90	91	96
Diameters in inches	5 7/16	5 7/16–6½	6¼	6¼–6½	6¼	6¼–7¼	6¼	6¼–7¾
Length in inches	4⅛	4⅝	4⅛	4⅝	4⅛	3¼	4⅛	10⅛

Higher pressures can be obtained by either using longer collars or collars and worms of larger diameters should such higher pressure be needed or preferred.

The metals from which the press components are constructed are also significant when determining the dimensions of the components which can be used to obtain satisfactory results. For example, a Stellite coating will decrease the friction between these parts and the cane material and thereby make changes in press dimensions advisable, if the most efficient operating forces are to be obtained. Stellite is a series of alloys comprising cobalt-chromium-tungsten which are manufactured by Union Carbide & Carbon Company. A press using Stellite, omitting screw flight **85** and pressure collar **86**, could have the remaining pressure collars and screw flights dimensioned as shown in Table 2.

Table 2

Screw Flights and Pressure Collars	87	88	89	90	91	92	93	94	95	96
Diameters in inches	5 7/16	5 7/16–6¼	5 7/16	5 7/16–6¼	6¼	6¼–7¼	6¼	6¼–7¼	6¾	6¾–7¼
Length in inches	4⅛	4⅝	4⅛	4⅝	4⅛	3¼	4⅛	3¼	4⅛	5⅛

The end structure **135** surrounding the remainder of shaft **80** beyond discharge cone **96** includes a cylinder **136** which controls the size of the outlet opening **140**.

To collect juice as it is expressed from the cane in the

preliminary and main expression zones 101 and 110, respectively, the press has a hollow supporting base 145 which defines a juice collecting chamber 146. As the juice is extracted through the expressing cage structure it drops to chamber 146 and flows through outlet opening 147 to a place of collection.

In certain instances it may be preferred that the raw cane be reduced in size by other means than chopper 15. One such means is the shredding apparatus 150 shown in FIG. 4, where raw cane is cut by shredding members 151 carried on a rotatable member 152. As cane is fed into shredder 150 it is cut by members 151, forced through the grid formed by bars 153 and reduced to a somewhat finer physical condition than is the case in the chopper-type cutter. After the cane passes bars 153 it falls into conveyor 155 which moves it into the hopper 20 for subsequent treatment.

A second cane cutting arrangement is provided by the crushing rolls 160 shown schematically in FIG. 5, which have a plurality of teeth 166 that crush or tear the cane into the desired sizes as it is passed between them toward hopper 20.

FIG. 9 illustrates another manner in which sucrose bearing fibrous material can be subjected to serial compacting operations with the addition of maceration fluid between the expressing steps. Specifically, screw press arrangement 170 which is analagous to the feeding arrangement utilizing cage 45 of FIG. 2, has a ring-like split cone 171 and clamping ring 172 which serve the same function as their counter parts of FIG. 2. In this case however a fluid injection manifold 173 is positioned beneath members 171 and 172 to supply fluid to the sucrose bearing material as it passes beyond the restricted opening defined by ring 171. In this manner the cane is subjected to free moisture at a time when it is expanding, and free of any large restraining pressure so that it can readily absorb moisture.

Generally the present process for expressing juice from sugar cane comprises feeding raw cane 12 into cutting means 15 where it is reduced in size by chopping, shredding, or crushing, depending upon the form of cutting apparatus used, and fed by conveyor 19 into the cane hopper 20. A series of revolving cane knives, for example, mounted to cut or chop the cane as it moves on the conveying means is a good method for reducing the size of the raw cane. Once within hopper 20 the cane feeds downwardly through the action of feed worm 35 into the vertically arranged expression cage 45. As the screw attempts to advance the cane through restricting orifice 66, a back pressure is built up in the cane within the cage. The mechanical pressure thus exerted against the cane causes a rupturing of the juice containing cells contained in the sugar cane fibers with a consequent initial expression of juice through the spacings between cage bars 46.

After passing through restricting orifice 66 the partially expressed cane material can either be treated with a maceration fluid from manifold 173 as it is expanding and extremely receptive to absorption of the fluid or, if the manifold is not used, can continue through further chamber 71 where the pressure is released and the material allowed to expand to substantially its original size without the addition of fluid. After chamber 71 the material enters press inlet chamber 72 where feed worm 84 moves it longitudinally toward the press inlet. Since feed worm 84 is driven by gear 76 at a higher rate of speed than the press screw flights are driven by gear 77 the cane is once again compacted, this time in the area defined by preliminary expression cage 100. This second compacting achieves a second expression of juice from the cane, the juice flowing outwardly through the cage to chamber 146.

The first screw flight 85 takes the compacted cane from cage 100 and moves it inwardly toward pressure collar 86 in a generally helical path which creates a defibering action under pressure with mixing of the fibers to achieve a reorientation of the cellular structure. Reorientation contributes to further expression of juice as the cane is forced over the collar 86, where a crushing or expressing action occurs. Screw flight 87 operates in much the same manner as screw flight 85 in that it takes compacted material from an expressing zone, viz., that zone between collar 86 and screen bar section 115, and defibers and mixes the fibers while moving them onward toward collar 88. The worms and collars following worm 87 and collar 88 operate on the cane in the same manner except that the increased body diameters of worm 95 and discharge cone 96 cause a greater packing of the cane at the outlet end of the press.

Using a press of the dimensions set forth in Table 1, it has been found that sugar cane having an inherent moisture content of 85% yielded approximately 89.7% of its moisture content in the preliminary expression cage 100 of the main expression cage 120. Thus, the bagasse had a final moisture content of about 32% with a sucrose content of 5.51%. In a second test using the same press, cane having the same inherent moisture content gave a recovery of 93.1% of the juice with a final sucrose content of 3.89% and a moisture content of 30.0%.

Thus, in passing through the press the cane material will be subjected to intermittently varying pressures by virtue of the fact that the maximum diameters of the compacting collars are greater than the maximum diameters of the screw flight bodies. This feature results in a partial relaxation of pressure while still maintaining continuous expressing pressure as the material clears the rearmost edge of each of said collars. While the precise conditions developed in the expression cage are not fully understood, largely because of the practical difficulties of accurately determining the pressure and other conditions at a series of points throughout the cage, it is believed that the action may be described generally along the following lines. As the pieces of cane are fed forwardly by the flights on the feed worm portion, they are packed into the first screw flight portion and because of the difference in the rate at which such flights are driven, a substantial pressure is developed on the cane in such first flight. This is accompanied by expression of juice through the screen bars and additional pressure is built up as the material passes over the first collar, and its rotation is interrupted by the breaker bars. This is accompanied also by a mechanical action which results in some defibering and reorientation, with the result that further juice is extracted and the fibers are advanced to the next flight which they encounter with a different distribution.

As the material continues its passage through the cage, it encounters successive interrupted flights alternating with the series of collars and breaker bars so that such crushing, defibering and reorienting occur successively. It will further be noted that the clearance on the last flight between the body of the flight and the inner periphery of the cage is less than that of the other flights, thus resulting in an increased pressure when the material reaches the discharge end. This not only contributes to a higher effective yield but also assures the more thorough working of the material to express the maximum amount of juice therefrom before it is finally discharged.

Since the mean pressure exerted on the cane material is between the pressure created by the screw flights and the pressure created by the pressure collars it is apparent that pressures below the mean pressure are used while the material is being mixed and defibered and pressures above the mean pressure are used when compacting the material to express the juice therefrom. Additionally, the mean pressure is ascendant because of the increased pressures created toward the outlet end of the press.

Although the forces against the material during its passage through the press are intermittently varying, it should be noted that the mean pressure is quite high, probably being in excess of 5,000 p.s.i., so that the pressure against the material is at all times on a high level. Maintenance of the pressure at a high level while it moves

longitudinally through the press results in creation of frictional heat which materially raises the temperature of the cane and softens the walls of the parenchyma cells and fibrovascular bundles aiding the expression of juice from the cane. For example, the juice toward the discharge end of the press is at about a boiling temperature and the discharged bagasse at about 180° F., the temperature of the bagasse probably being greater while in the press and cooling somewhat upon release due to expansion.

As the cane progresses through the press the juice is expressed in the compacting zones and falls into collecting chamber **146** from whence it is collected in a suitable storage receptacle. Expressed cane bagasse is discharged through outlet opening **140** into collection means separate from the juice collecting means so that no reabsorption of the juice can occur after the pressure is relaxed.

FIG. 7 of the drawings illustrates an apparatus **175**, comprising a roller type mill **176** and a screw type expressing press **177**, for removing the juice from sugar cane and related sucrose bearing fibrous material.

A conveyor **180** delivers raw cane **181** to opposed crushing rolls **182** which have serrated or otherwise suitably formed working surfaces to break the cane and deliver it onto a second conveyor **183** with 40% to 70% of the original juice content removed. The juice taken from the cane at this point can be collected in a receptacle **185** for subsequent handling or it can be combined with juice extracted in later operations. The second conveyor, **183**, is positioned to discharge the crushed cane into the nip of the mill rolls **186** of the mill **176**. From mill **176** the cane passes through the rolls of mills **190** and **192** by means of conveyors **191** and **193** and is finally delivered onto a discharge conveyor **194** as bagasse having from about 85 to 95% of its sucrose content removed. Fluid expressed from the cane during its passage through the mills is collected within a tank **195** and from there directed to a suitable point of collection. The recovery of such high percentages of sucrose is made possible by the addition of a suitable maceration liquid, such as water, to the cane through fluid conducting pipes **200** prior to its delivery to mills **190** and **192**. Fluid can be obtained from a tank **201** which is under pressure from pump **202**, the tank being supplied with fluid through an inlet pipe **203**.

The bagasse being discharged from mill **192** onto conveyor **194** is dumped into the feed hopper **205** of screw press **177** where it can be supplied with maceration fluid by means of a pipe **206** in those instances where preferred. Pipe **206** extends from the supply tank **201** to the hopper **205**. From hopper **205** the material moves downwardly into the interior of the press where it undergoes the same physical defibering and expressing treatment previously described in connection with the screw press shown in FIG. 3.

The screw flight and pressure collar dimensions used in the press when running bagasse may vary from the dimensions set forth in Tables 1 and 2, exemplary dimensions being set forth in the following Table 3.

dropped to 1.93%, these figures representing considerable additional recovery of material from the mill bagasse. It is also important to note that the bagasse will have increased fuel value by virtue of the reduced moisture content, a significant feature due to the fact that many mills use the bagasse as fuel for operating the plants.

A second run which was conducted using bagasse with a moisture content of 48.75% and a sucrose content of 2.78% but adding 500 pounds per hour of maceration water to the material as it entered hopper **205** resulted in a bagasse discharge from screw press **177** having a moisture content of 37.0% and a sucrose content of 2.12%. The addition of this amount of water raised the moisture content of the bagasse to approximately 60% prior to the final expressing and defibering operation which occurs in the screw press.

A slightly modified form of apparatus for subjecting sucrose bearing materials to expressing operations with the addition of maceration fluid between the two operations is shown in FIG. 8. Here, two interrupted flight screw presses, **210** and **211**, are arranged in series so that the discharge opening **212** of press **210** will deliver bagasse into the hopper **213** of the second press. A fluid reservoir **215**, having a pump **216**, is provided with a pipe **217** for supplying maceration fluid to bagasse just as it is expanding upon leaving press **210**, thus insuring that the bagasse will quickly soak up a maximum amount of maceration fluid.

While the process and form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that this invention is not limited to this precise process and form of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. The process of expressing juice from sucrose bearing fibrous material in plants utilizing a roller type juice expressing mill comprising, feeding raw fibrous material into the mill to effect crushing thereof between the rolls and release of juice therefrom, discharging crushed bagasse from the outlet end of said mill, collecting the bagasse separate from the juice at a location removed from the material passing through the rolls, advancing the collected bagasse to the inlet of an expressing press having drainage openings in the side walls thereof, and feeding the bagasse through the press while exerting a sustained relatively high mechanical pressure on the bagasse to express additional juice therefrom through the drainage openings in the side walls of the press.

2. The process of expressing juice from sucrose bearing fibrous material in plants utilizing a roller type juice expressing mill comprising, feeding raw fibrous material into the mill to effect crushing thereof between the rolls and release of juice therefrom, discharging crushed bagasse from the outlet end of said mill, collecting the bagasse separate from the juice at a location removed from the material passing through the rolls, supplying maceration fluid to said crushed bagasse to increase the moisture content thereof, advancing the collected, moistened bagasse to the inlet of an expressing press having drainage openings in the side walls thereof, and feeding the bagasse through the press while exerting a sustained mechanical pressure on the bagasse to express additional juice therefrom through the drainage openings in the side walls of the press.

3. The process of expressing juice from the cells of

Table 3

Screw Flights and Pressure Collars	85	86	87	88	89	90	91	92	93	94	95	96
Diameters in inches	5 7/16	5 7/16–6 1/4	5 7/16	5 7/16–6 1/2	5 7/16	5 7/16–6 1/2	5 7/16	5 7/16–6 1/2	5 7/16	5 7/16–6 1/2	6 1/4	6 1/4
Length in inches	6 3/8	2 1/2	4 1/8	4 3/8	4 1/8	4 3/8	4 1/8	3 1/4	4 1/8	3 1/4	4 1/8	5 1/8

In tests conducted at a feed rate of 2½ tons of cane per hour, without the addition of maceration water between the mill **176** and the press **177**, the mill discharged bagasse having a moisture content of 48.75% and a sucrose content of 2.78%. By then running this bagasse through hopper **205** and press **177**, the press being dimensioned according to Table 3, the bagasse moisture content was lowered to 33.0% while the sucrose content

sucrose bearing bagasse being discharged from a roller type juice expressing mill comprising, introducing the bagasse into the feed chamber of a screw type press having alternately arranged compacting and defibering zones within an elongated juice expressing cage having drainage openings in the side walls thereof, freeing juice from the bagasse by exerting a sustained high mechanical pressure thereon while advancing the bagasse through the compacting zones, advancing the bagasse through said defibering zones intermediate each of said compacting zones with concurrent reorienting of the fibers contributing to further expression of juice, and discharging bagasse having a moisture content not exceeding 40% by weight through the outlet end of said press.

4. The process of expressing juice from the cells of sucrose bearing fibrous material comprising, introducing the fibrous material into the feed chamber of a first screw type press having drainage openings in the side walls thereof, subjecting the material during its passage through the press to crushing, defibering and mixing actions under substantial mechanical pressure to effect expression of juice through the openings and accompanying lower retention of juice in the material, discharging the fibrous material through the outlet end of the press, adding maceration fluid to the discharged fibers to raise the moisture content to near the original amount, introducing the discharged fibers into the feed chamber of a second screw type press having drainage openings in the side walls thereof, subjecting the material during its passage through said second press to crushing, defibering and mixing actions under substantial mechanical pressure to effect further expression of juice contributing to a high yield, and discharging the fibers through the outlet end of said second press.

5. The process of expressing juice from the cells of sucrose bearing fibrous material comprising, introducing the fibrous material into the feed chamber of a first screw type expressing press having drainage openings in the side walls thereof, subjecting the material during its passage through the press to crushing, defibering and mixing actions under substantial mechanical pressure to effect expression of juice through the openings and accompanying lower retention of juice in the material, discharging the fibrous material through the outlet end of the press, concurrently adding maceration fluid to the fibers as they are expanding upon being discharged from the outlet end of the press to raise the moisture content of the fibers to near their original amount, introducing the discharged fibers into the feed chamber of a second screw type press having drainage openings in the side walls thereof, subjecting the material during its passage through said second press to crushing, defibering and mixing actions under substantial mechanical pressure to effect further expression of juice contributing to a higher yield, and discharging the fibers through the outlet end of said second press.

6. A process for the extraction of sugar juice from sugar cane comprising, cutting the sugar cone into appropriate lengths, crushing the cut lengths of cane to rupture a substantial proportion of the cells containing sugar and, passing the prepared cane through at least one screw press whereby to extract sugar juice from the crushing cane.

7. A process for extracting sugar juice from sugar cane which comprises rupturing a substantial proportion of the cells containing sugar to produce prepared sugar cane, passing the prepared cane through a series of sets of milling rolls and thereafter through at least one screw press, whereby to effect extraction of sugar juice from prepared sugar cane.

8. In the process of extracting sugar juice from sugar cane which comprises crushing the sugar cane to rupture at least a substantial proportion of the cells of the sugar cane which contain sugar to form the prepared sugar cane, passing the prepared sugar cane through a first set of milling rolls to form first bagasse, adding maceration liquid to the first bagasse, passing the thus treated first bagasse through a second set of milling rolls, and continuing to alternately add maceration liquid and press the resulting treated bagasse until a final bagasse is obtained, the improvement wherein the liquid content of the final bagasse is further decreased comprising passing the said final bagasse through a screw press.

9. A process as defined in claim 6 comprising the additional steps of adding maceration liquid to the material discharged from said screw press, and then feeding the material through a second screw press to express liquid therefrom with the maceration liquid promoting extraction of juice from the material.

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