

[54] **COMBINED MIXER, KNEADER AND PRESSER PARTICULARLY FOR FOOD PROCESSING**

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[58] Field of Search..... 259/6, 5, 191, 192, 193, 259/104, 9, 10, 7, 8, 25, 26, 23, 24, 43, 44; 100/145, 146

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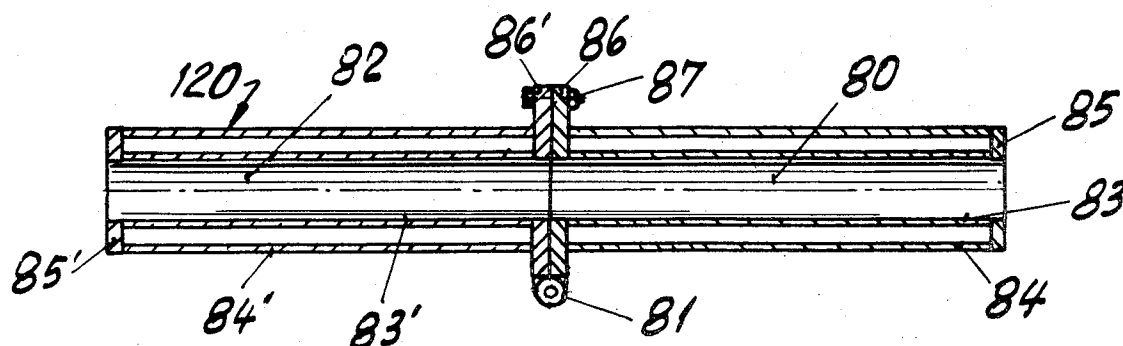
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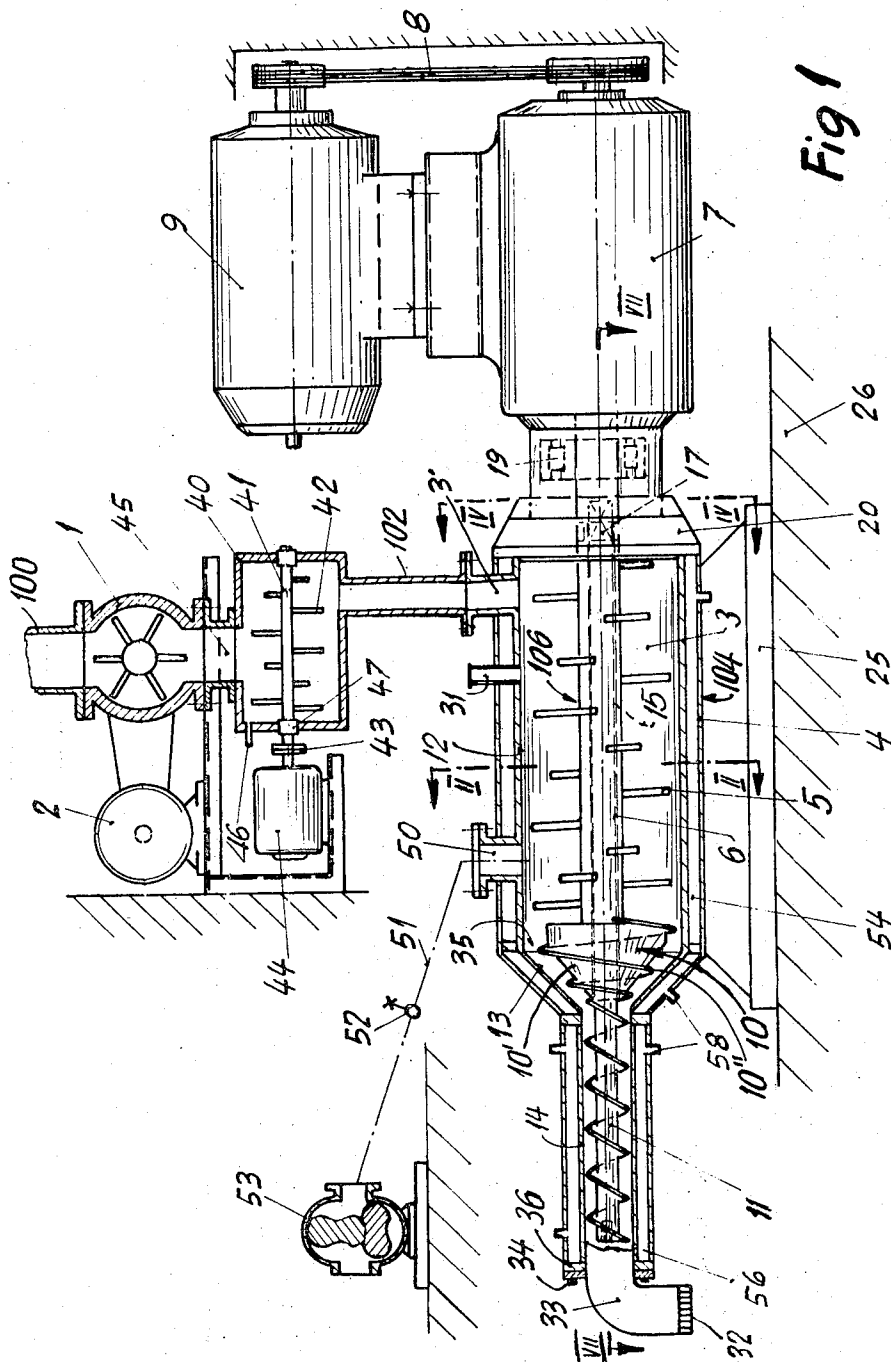
[57] **ABSTRACT**

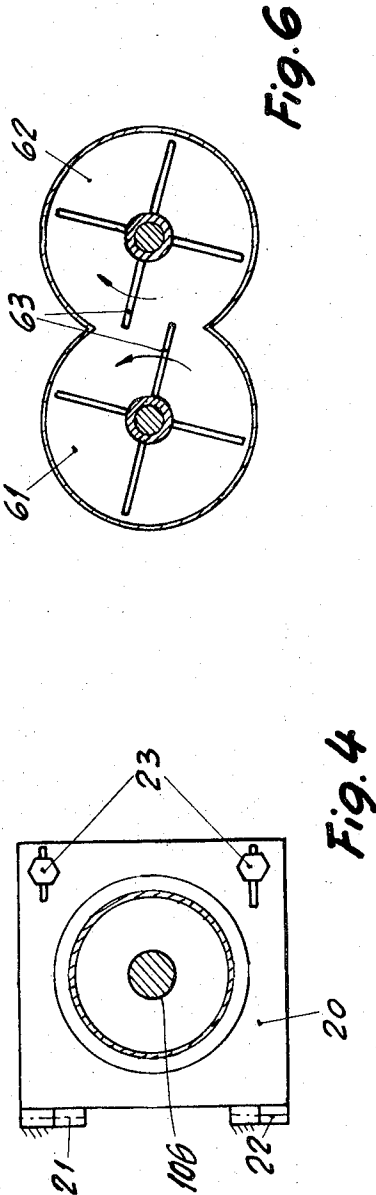
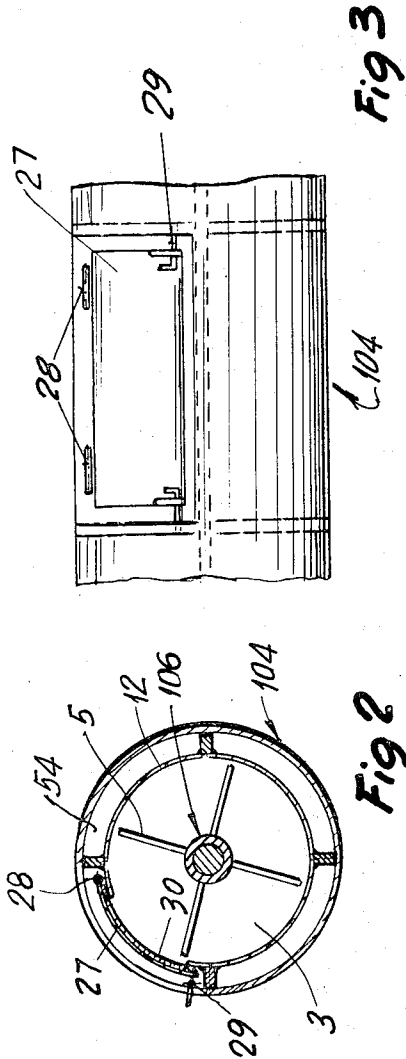
A combined mixer, kneader and presser for materials particularly for foods such as pasta comprises a housing having a wide diameter mixing portion, a small diameter pressing portion and an intermediate conical

kneading portion connected between the mixing portion and the pressing portion. An inlet for the materials to be treated is connected into the mixing portion and the pressing portion has a free end with a discharge which receives a head carrying a press mold through which the material is directed. A driving motor has a driving transmission connected to the free end of the mixing portion of the housing and a single shaft extends through the housing and is connected to the driving transmission and is rotated thereby. The shaft includes a mixing portion having radially extending arms which rotate in the mixing portion of the housing, a kneading portion with a conical core and a kneading screw and a smaller diameter cylindrical pressing portion with a press screw which rotates in the pressing portion of the housing. The pressing portion advantageously comprises a separate shaft element which is received in the hollow interior of the portion making up the mixing shaft and the kneading portion of the shaft. The housing is formed with a door either at the drive end of the mixing portion or at the opposite end adjacent the intermediate conical kneading portion. The door includes a fixed part which is connected to the drive and a movable hinge part which may be swung outwardly from the fixed part. In the one embodiment the swinging part includes all of the housing parts which may be swung openly from a fixed mounting of the housing adjacent the drive end. In the other embodiment the swingable parts include the conical intermediate portion and the pressing portion of the housing. When the door is swung open the individual housing parts are accessible for cleaning and repair.

19 Claims, 11 Drawing Figures







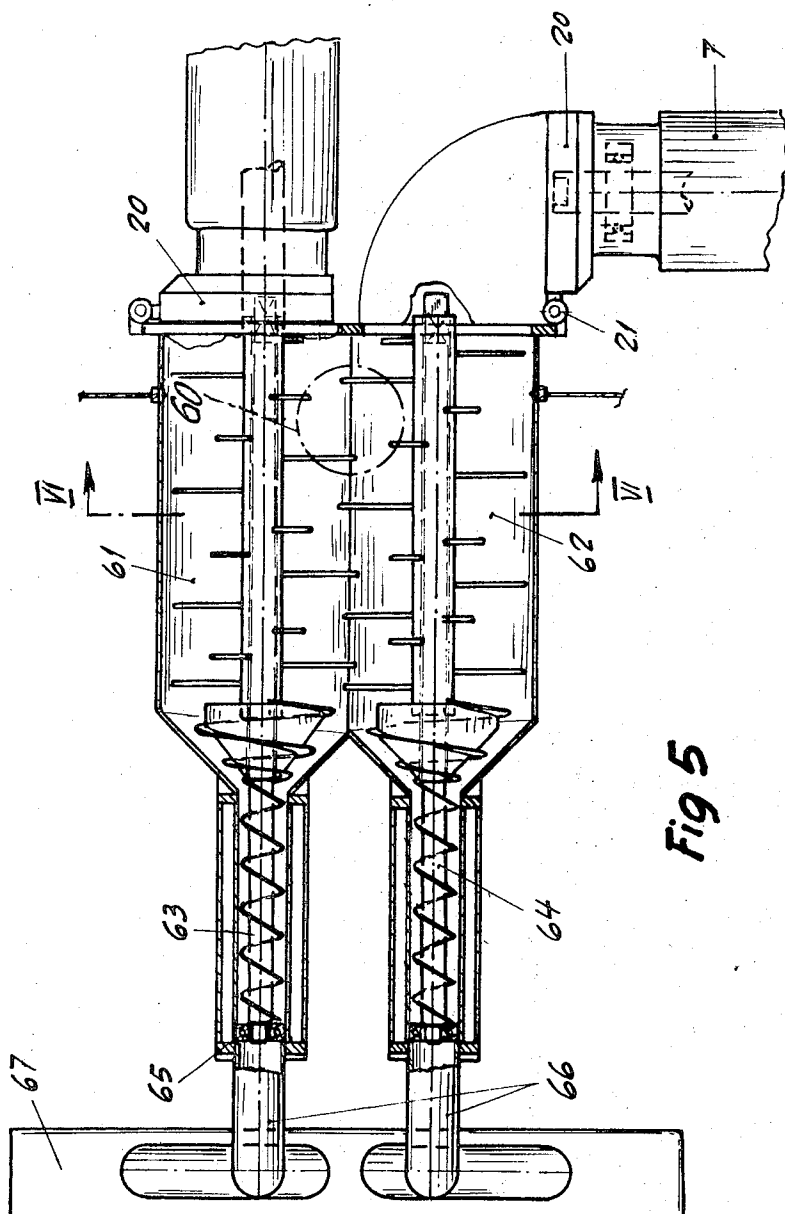
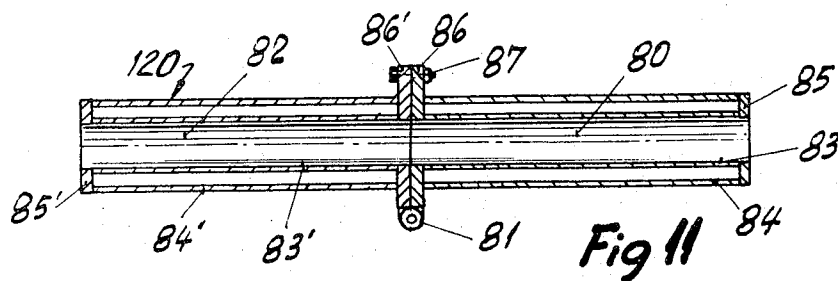
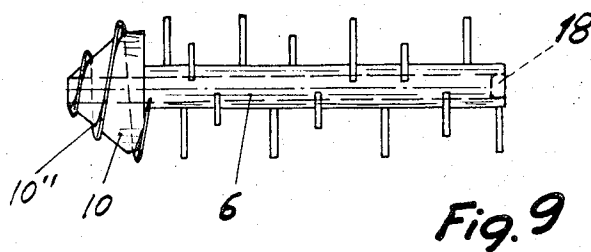
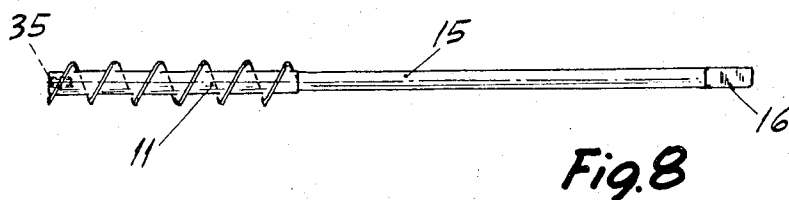
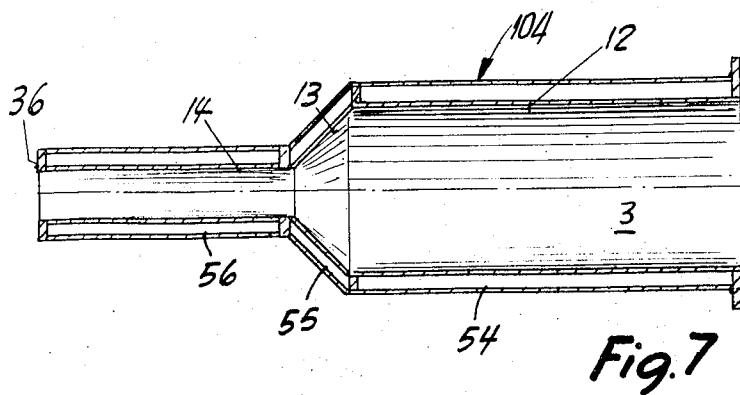
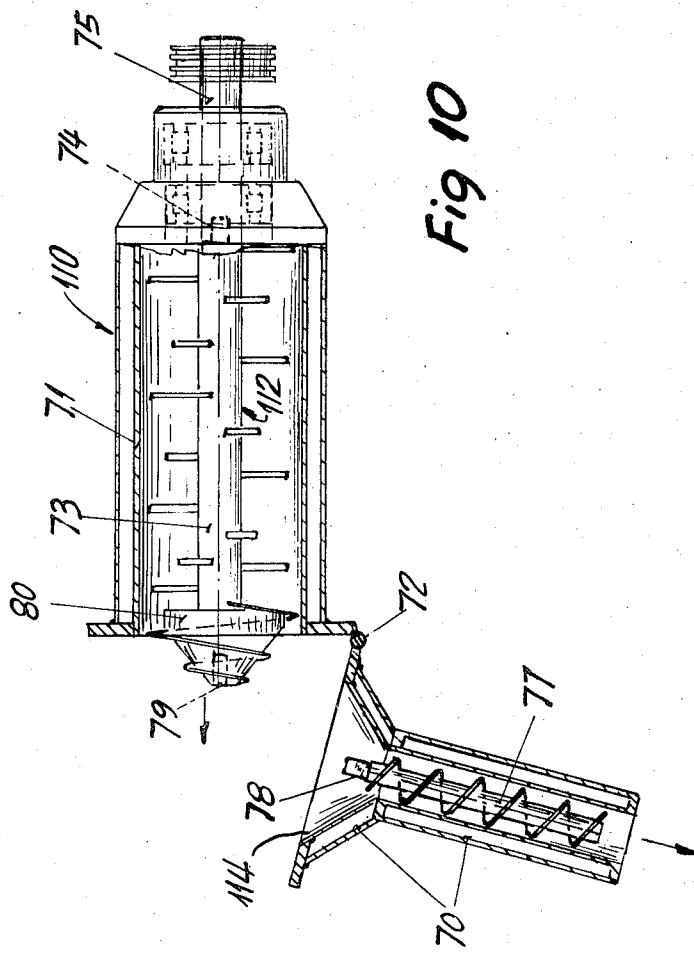


Fig 5





COMBINED MIXER, KNEADER AND PRESSER PARTICULARLY FOR FOOD PROCESSING

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the construction of two devices for pressing and kneading materials and in particular to a new and useful combined mixer, kneader and presser for materials having a single shaft and with a housing having a hinge portion permitting easy access to the interior thereof.

2. Description of the Prior Art

In the production of pasta, increased production of snacks and animal foods, such as dog food in cube form, has made it necessary to place the individual ingredients which will form the product in finely dosed quantities into a relatively large trough where the materials are mixed by means of a rotating mixer. The large trough permits a sufficient stay time and action period for the individual additives such as water and other components, for example, such as semolina or flour materials. After mixing the product is usually directed by an auxiliary screw into a kneading and pressing stage, in which the product is also either heated or cooled as required. For example, in the production of certain types of food products such as snacks, the hot dough is pressed at high temperature through a mold where it expands when it issues and is cut into pieces by knives and fed to the packing station for further treatment. Other similar food products require gelatinized pellets which after they issue from the mold are expanded after they are first dried.

In the known processes three separate machines are generally required: a large trough mixer, a kneading device and a pressing device. Particularly when all of these three machine components are equipped with independent variable speed drives, the necessary equipment for carrying out most treatments of the foods can be effected. A disadvantage in the known construction is that the separate components require a large expenditure of money. It is already known to arrange the mixing and kneading stages on a single shaft in the production of bread, for example. With such an arrangement there is thus only one drive for the main power consumers and there is no need for expensive control and regulating devices. In certain dough presses of this type, a mixing trough and a kneading screw which extends over the entire length of the housing are arranged on the same shaft. The raw product is added from the top onto the longer portion of the mixer length. The mixing blades advance the material to one end of the kneading screw, and this pulls the product at the same time and delivers it at the opposite end of the finished dough. The nesting of the mixing and kneading device results in a rather expensive construction. A disadvantage of this construction is the unfavorable transfer of the mixed material to the kneading screw which moves the material in an opposite direction. The product is not fed positively from one stage to the other. Even interruptions in the material flow are possible with the known constructions.

In another embodiment of the type mentioned above for the production of baking dough, a mixing, conveying and kneading stage of constant diameter are arranged in series on a continuous shaft, starting at the material inlet. For baking dough much water is added

to the flour, and thus a relatively liquid dough is obtained which makes it possible to permit mixing and pressing in a simple manner because there is sufficient water for each ground particle. The raw flour is mixed in this construction by small rotating mixing arms directly under the inlet and the material is fed by its inclined position directly to the pressing screw which compresses it and feeds it to the kneading stage proper. For pasta about 27-33 percent of water is added to the semolina. If this construction were used for the production of pasta, the semolina would no longer be wetted uniformly with water, due to the short time in which the semolina stays in the mixer, and particularly the semolina grain could not readily absorb the water in the short time available. This manifests itself later in the form of small white dots on the finished product. In addition with the known arrangement there is no pressing stage.

In another bread dough press of this type the raw product is fed directly into the pressing screw. This screw engages the raw product and mixes and kneads it at the same time. In order to intensify the kneading process various diaphragms are arranged in the kneading unit to narrow the cross section and to interrupt the screw threads. Behind it is arranged a stage with a wider cross section to homogenize the dough and to aerate it and evacuate it if necessary. The finished dough is moved through a lateral pipe for further processing. This device also has at its end an inadequately designed pressing stage, despite its very long construction, and it cannot be used for the production of pasta and snacks, where the pressure of 100 kg/cm² and more must be generated under certain circumstances.

In order to obtain a homogeneous end product in the production of pasta and partly also of snacks, the semolina or raw product and not the dough must be mixed very carefully and homogeneously with additives and it must be wetted, if necessary. If there are still individual unwetted semolina lumps in the dough, satisfactory products can still be obtained by additional kneading and beating of the dough.

Another factor that prevents the general use of the known single shaft press is that it is very expensive and complicated to keep clean so that the operating personnel must receive special training. Due to the constant change in eating habits, a food manufacture faces the fact that he must have a great variety of different methods and molds available as it is customary in other industrial sectors and which are very soon outdated by new recipes. In addition to the requirements of cleanliness and sanitary conditions, which are demanded today, there is additional requirements that due to the frequency change in products and shapes, the cleaning must be effected on the spot and particularly in a very short time by less skilled personnel.

SUMMARY OF THE INVENTION

The present invention provides a combined mixer, kneader and presser for materials particularly for food such as pasta which is capable of operation and disassembly for cleaning in order to maintain sanitary requirements, and which includes a means for mixing the raw product uniformly with additives, maintaining a constant stay period while the materials are being subjected to treatment and which includes an arrangement which permits it to be used for carrying out many dif-

ferent types of operations, and for feeding the product to the kneading or pressing stage after the ingredients are first mixed. The single shaft construction, according to the invention, is characterized by an arrangement in which at least one side, preferably the driving side, of the housing at the widest or greatest dimension portion of the mixing stage is designed as a door which permits the housing to be swung as a unit, as a pivotal door connection. In the preferred arrangement the end portion of the mixing chamber which is opposite to the drive connection is formed by a conical portion housing a kneading screw. With the surprisingly simple means described, it is thus possible to use a single shaft press which is satisfactory both from the technical and the sanitary point of view for materials such as pasta, snacks and other foods for human and animal nutrition. The sanitary requirements are thus met both for the operation and for the cleaning of the device itself. The construction is such that there are no dead corners where semi-processed foods can get stuck during the operation. All parts are easy to disassemble and to clean, and this is made possible primarily by forming the housing with a portion thereof as a hinged part which is swingable to one side of a stationary part in order to open the end thereof to permit access to the internal operating mechanisms and parts. In particular the passage from the mixer, which generates no marked axial pressure at the location where it extends into the kneading stage having a relatively high pressure is made very accessible by forming the hinge at the connecting portion between these parts in a simple and yet, nevertheless, safe manner. The material flow is steady and the conditions in the following stages remain constant in the housing construction provided. The mixing chamber is dimensioned substantially larger than the kneading and pressing chamber so that it provides a means for establishing good mixing of the ingredients and a sufficient stay period during the mixing operation.

The inventive apparatus advantageously includes means for feeding a material such as semolina through a regulable feeding element such as a lock or screw. The amount of material in the mixer is kept constant by utilizing a feed supply for dosing proper additional amounts to the materials in the mixer as necessary, and this makes it possible to maintain a stay period in the mixer at a constant value.

The preferred construction includes a single shaft having a kneading portion arranged in the kneading portion of the housing which has a core of tapering form tapering from the larger diameter mixing portion to the smaller diameter pressing portion of the housing. An air gap is provided between the tapering core of the kneading screw and a surrounding housing portion in order to increase the kneading effect over that which can be effected by a very poor conveyance of a kneading screw.

The apparatus of the invention also advantageously includes a high speed mixer connected in the inlet line to the mixer of the main housing and which is of small dimension and which provides operation at very high speed output. In addition the main housing mixing chamber advantageously includes a connection to a pump such as an evacuation pump for establishing a vacuum in the housing. This makes it possible to exhaust a major portion of the air from the product being treated so that the tendency of the dough to form air

inclusions is greatly reduced during the operation. Extreme values of absolute pressures, that is a vacuum at the end of the kneading stage, can be eliminated with such an arrangement. The power consumption is reduced compared to the existing single shaft presses. There is also no unnecessary mechanical stress on the dough by kneading or shearing since the fluid semolina is already evacuated and not the viscous dough. The housing advantageously includes means for passing a cooling medium or a heating medium through the hollowed walls thereof which makes the unit usable with a process for the production such as snacks or animal foods. The housing may be formed with two housing portions arranged side by side so that two mixing troughs or chambers are connected together and arranged to advance the materials through separate kneading stages and pressing stages into a common collecting trough which feeds them through a discharge press. The inlet feed connection is advantageously arranged to connect into the two mixing chambers at a central location located therebetween. With the invention any one of the individual sections may be subdivided into more than one part which are connected together such as by a fixed flange joint connection or by a hinged connection.

Accordingly it is an object of the invention to provide an improved combined mixer, kneader and presser for materials particularly for foods such as pasta which comprises a housing having a small diameter pressing section, a large diameter mixing section and an intermediate diameter kneading section connected between the mixing section and the pressing section and with a single shaft extending through the housing having mixing, kneading, and pressing elements arranged thereon located in the various housing portions, and wherein the housing has a door formation adjacent at least one end of the mixing portion which comprises a hinge connection including a portion which is fixed in respect to the drive means for driving the shaft and a portion which may be swung outwardly to one side of the fixed portion to facilitate access to the interior of the housing for removal and cleaning of the associated parts.

A further object of the invention is to provide a device for treating materials, which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

FIG. 1 is a longitudinal sectional view of a portion of a combined mixer, kneader and presser for treating materials particularly foods such as pasta and which is constructed in accordance with the invention;

FIG. 2 is a section taken along the line II—II of FIG. 1;

FIG. 3 is a partial side elevational view of the door mounting shown in FIG. 2;

FIG. 4 is a section taken along the line IV—IV of FIG. 1;

FIG. 5 is a horizontal sectional view of another embodiment of combined presser, mixer and kneader;

FIG. 6 is a section taken along the line VI—VI of FIG. 5;

FIG. 7 is a section taken along the line VII—VII of FIG. 1 but with the internal parts being removed;

FIG. 8 is a side elevational view of the shaft pressing portion;

FIG. 9 is a side elevational view of the shaft kneading and mixing portion;

FIG. 10 is a partial longitudinal sectional view of another embodiment of combined mixer, kneader and presser; and

FIG. 11 is a longitudinal sectional view of a presser section of the housing of another embodiment of the invention.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in particular, the invention embodied therein in FIGS. 1-4 and 6-9 comprise a combined mixer, kneader and presser for materials, particularly for foods such as pasta, which includes a raw material feeding conduit 100 which connects into a dosing lock 1 which connects through a conduit 45 leading to a high speed mixer 40 which discharges through a conduit 102 into a feed connection 3' of a main housing or housing 104 of the combined mixer, kneader and presser.

In accordance with the invention the combined mixer, feeder and presser 104 includes a mixing stage portion or mixer portion 4 which has an interior defining a mixing chamber or trough 3 of uniform relatively large interior dimension which connects a one end to an intermediate kneading part or conical part 13. The conical part 13 tapers toward its outer end and is connected at this outer end to a cylindrical pressure part or pressing part 14 of uniform interior diameter which is of a smaller diameter than the mixing chamber 3. A single shaft generally designated 106 is connected at one end to a drive transmission 7 which is operated by a drive motor 9 driving through a belt gearing 8. The shaft 106 extends throughout the housing 104 and it includes a mixing shaft portion 6 having mixing arms 5 which extend radially outwardly therefrom in the mixing chamber 3. In addition the shaft 6 contains a kneading portion 10 which includes a conical core 10' with a spiral kneading screw 10'' which operates in the conical part 13. The shaft 106 also includes an outer portion or pressing screw 11 which extends outwardly from the kneading part 10.

The housing includes a double wall formation or cylindrical hollow jacket 12 which tapers conically at the kneading part 13 and it also includes a hollow wall portion at the cylindrical pressing part 14. The pressing screw portion 11 advantageously comprises a separate part which is coupled with a shaft piece 15 as shown in FIG. 8 which extends through the hollow portion of the kneading shaft portion 10 and the mixing shaft portion 6 and it is connected through a squared end 16 to the drive mechanism 7. For this purpose the drive mechanism 7 has a shaft which drivingly engages the mixing shaft portion 6 and the mixing shaft portion 6 includes a squared interior recess 18 which is engagable with the squared end 16 of the extension 15 of the pressing shaft portion 11. The torque therefore is applied through the mixing shaft assembly 106 by the engagement of the shaft portion 6 with the drive mechanism 7 and the portion 6 in turn drives the extension 15 of the kneading portion 11 by engagement of the squared end 16 and the recess 18.

The press screw portion 11 of the shaft 106 has little play between it and the wall of the press portion 14 of the housing so the screw acts as a bearing for the shaft 106 even though there is no pivot bearing itself. On the driving side a very strong end bearing 19 is provided for the driving shaft of the transmission 7.

In accordance with a feature of the invention the entire end face of the drive 7 at the location of its connection to the housing 104, is formed as a hinged door construction comprising a pivotal transverse door member 20 which is mounted on two fixed hinges 21 and 22. In the position shown in FIG. 1 the housing is mounted on the door 20 and it is held in an axially aligned position by securing bolts 23 located on the opposite side of the door from the hinges 21 and 22. The door which carries the housing 104 therefore, is locked in a forced closed manner on the transmission 7. The very great shearing forces which act on the mixing arms 5 as well as the kneading and pressing parts 10 and 14 are closed or carried by bearings 19 of the transmission and by the door 20. The static and dynamic forces of the drive are transmitted to the door 20 to the housing 104 through a base 25 to the foundation 26.

As best seen in FIG. 2 access to the mixing chamber 3 may be obtained through a service door 27. The door 27 is solid and has top hinges 28 and a bottom safety snap closure 29. The door 27 is pressed airtight onto a packing 30 against the housing close to the drive side. A feed inlet pipe 3' connects to the pipe 102 and in addition there is an inlet fitting 31 for liquids or other components which are to be added to the mix in the chamber 3.

A press mold 32 is connected to the opposite free end of the cylindrical portion 14 and it is secured in position by a flanged end which is bolted in place by retaining bolts 34 which are engaged against an end face 36 of the cylindrical pressing part 14.

The operation of the single shaft combination mixer, kneader and presser is as follows:

The raw product, for example, semolina is fed into the mixing trough 3 through the dosing lock 1. Due to the feeding of the product through the chambers with the lock 1 the mixing trough 3 is sealed from the atmosphere. In practice a dosing screw is arranged ahead of the lock, but in order to feed the material thereto, and in some instances a dosing screw is substituted for the lock 1. This latter will depend upon whether the dosing accuracy must be rigidly maintained or whether the pressure conditions in the mixing trough must be controlled. The raw materials, water or other admixtures, are charged into the mixing chamber 3 at the drive end and are moved by kneading arms 5 toward the kneading portion 13 for engagement by the kneading part 10 of the shaft 106.

A very advantageous feature from the sanitary standpoint is the direct engagement of the mixing material by the shaft kneading part 10 which has a large diameter portion so that the engagement is over the greatest possible circumference and thus, dead corners are eliminated. Because the kneading already starts on the relatively large diameter of the interior of the chamber 3 the kneading stage can be kept short, so that there will not be any transition cross sections which are difficult to clean and which hinder the flow. The kneading process in generally interfered with by the poor conveyance of the materials and by the many return movements of the materials which were required by the prior

art devices. The construction of the present invention with the tapering knead shaft portion 10' provides a particularly advantageous construction for the movement of the material. Care is taken that the depth of the screw portion 10'' is not made too great so there will be no tendency for a thick layer of dough to stick to the core, since this would be harmful to the uniformity of the quality of the end product. Various designs of the core 10' and the screw threads 10'' may be obtained in order to vary the free flow cross section as required from one process to the next and to effect either an increasing or decreasing cross section between the shaft portion 10 and the wall portion of the kneading section 13 of the housing. The inlet crossing to the kneading section is deliberately over dimensioned in order to intensify the kneading process. The dosing device 1 may be regulated in order to provide a desired in feed to the mixing chamber 3 to permit pasta to be produced. The volumetric dosing element will never have a 100 percent dosing effect, due to the variable specific volumes. In many cases it is therefore necessary, in order to correct deviations from the desired dosage, to keep the amount of the product constant with an additional control device such as a control lever (not shown), which may be arranged in the mixing chamber and by employing a corresponding back coupling or regulation of the dosing wheel of the dosing lock 1. This ensures 100 percent mean stay period in the mixer since the discharge of the homogeneous dough with the pressing screw portion 11 is uniform.

The invention permits the easy maintenance of the sanitary requirements for operation. As indicated in FIGS. 1-4 and 7-9 the device may be stopped so that all operation is cut off and the interior parts may be cleaned rapidly by opening the cleaning doors 20 or 27. For this purpose the main in feed and the dosing lock 1 are stopped and the main drive 7 is run for some time thereafter. Any existing residues can be brought by hand toward the kneading screw 10 by opening the service door 27 which can stop the entire plant and be discharged by starting the motor again briefly. The fastening screws 34 at the end of the pressing part 14 are loosened to permit removal of the head 33. The pressing screw shaft 11 together with its extension 15 can be pulled out by a few centimeters with a simple device similar to a ball bearing extractor by bearing on the end face 36. The square portion 16 of the shaft extension 15 is thus pulled out from the square portion 17 of the drive 7 and the recessed square 18 of the hollow mixing shaft portion 6 of the shaft 106 is also disengaged. The drive 7 is disconnected from the shaft 106 thus completing the disassembly of all of the shaft portions except the shaft portion 10 and the shaft portion 6, as shown in FIG. 9. Thus all of the parts are separated for rapid cleaning as shown in FIGS. 7, 8 and 9. The shaft portions 6 and 10 are again united to the shaft portion 11 after they have been cleaned and the whole shaft assembly is centered in the housing by the positioning of the pressing portion 11. The doors 20 and 27 are again closed and the retaining head 33 is again attached, so that the entire press becomes ready again for another operational run.

Many products which include a part of the mixed material which has already been engaged by the kneading screw portion 10 may be returned into the mixing chamber 3 particularly if there is no risk that the partly kneaded lumps will stick to the mixing arms 5. The low

efficiency for the kneading is thus particularly utilized, since a relatively large air gap 35 is provided between the kneading screw 10 and the corresponding conical housing 13.

The excess material is returned to the mixing chamber 3. The kneading screw portion 10 enforces an additional material movement and a more intensive mixing in the mixing chamber 3, since a material flow component is enforced opposite to the normal direction of flow of the material which is already mixed from the feeding inlet 3 to the kneading stage at the kneading portion 13. In certain cases it is desirable that the mixing shaft portion 6 operate at a speed which is distinct from the press shaft portion 11 and in such cases they may be connected to the drive 7 so that two different speeds can be provided. In some instances it is desirable that the mixing material be engaged not by an advancing screw such as the screw 10'' but by a ladle-type blade which is arranged in the mixing chamber 3 and oriented to direct the material toward the kneading stage.

In some instances it is desirable to have a high speed mixer 40 arranged to process the material delivered through the inlet and before it enters into the mixing chamber 3. For this purpose a high speed mixer 40 includes a shaft having a plurality of high speed mixing arms 42 extending radially and which is rotated by a motor 44 driving through a clutch 43. The conduit 45 provides an inlet into the high speed mixer 40 and one connection at least, the connection 46, is provided for a liquid component or other components. The high speed mixer 40 has a substantially higher speed than the mixing shaft 106. The high speed mixer 40 as well as the mixer housing 104 are sealed from the outside by packings 47.

Since both the lock drive 2 and the high speed mixer drive 44 have very low motor outputs there is no great loss if only the shaft 106 is rotated by the main motor 9 and no high speed mixer 40 is employed. In large plants, 50-100hp are readily provided for the mixing, pressing and kneading stage, but high speed mixers and locks require only a fraction of this motor output. The principal energy consumer remains combined on a shaft 106. The mixer housing 4 can effect the various phases separately and more intensively than the high speed mixer 40. The high speed mixer 40 should be such that it will mix water and other additives in a very short time with the main raw product, which is usually also in a flowing or fluid state. The main mixer within the housing 104 permits a relatively long stay and action period which varies according to the product. The arrangement permits not only the use but the absorption of liquid into the interior of the semolina grain which is a prerequisite for the production of pasta of high quality. The speeds of the pressing and mixing shaft portions, are in most cases, relatively in good agreement. They are practically always low and relatively rarely above 100 rpm, for the production of pasta, they are rarely over 50 rpm. The inventive construction permits an easy aeration of the entire mixing through an aeration connection 50 which is connected through a conduit 51 (which is schematically illustrated) and through a valve 52 to a pump 53. Particularly in the case of the manufacturing of pasta, the application of a vacuum pump 53 will bring considerable advantages in the mixing trough chamber 3 so that the air inclusions need not be removed from the viscous dough but

are prevented during the formation before they start by evacuation of the chamber. In many cases it is thus possible to work with a much lower vacuum.

Heating or cooling media may be introduced into the hollow wall parts 54, 55 and 56 through connections 58. Particularly for the production of modern foods such as snacks or animal foods, hot steam can be injected additionally into the mixing trough 3 and/or circulated through the hollow walls of the housing. The mixing, dosing, kneading and the pressing stages can be heated or cooled separately.

The inventive device is thus capable of a surprisingly large number of uses without changing the concept of the construction which is of great value for the food processing industry which requires, at the present time, many changes in operation due to changes of eating habits.

The embodiment of the invention shown in FIG. 5 is advantageous for the production of pasta for long products. The dosing lock 1 and the associated in feed mechanism including the high speed mixer 40 may be connected as in the FIG. 1 embodiment to a single centrally located inlet 60 located between two mixing chambers or troughs 61 and 62 which overlap at the center thereof. The mixing arms are selected so that they can reach into the other mixing trough from respective opposite directions to result in an increase in kneading and pressing action. At the end of the pressing screw 63 and 64 can be arranged bearings 65. Connecting lines 66 lead into a common distribution head 67 having long pressing molds (not shown). The method of operation of this embodiment is not different from the single shaft press but it has a very great advantage in that there is a constant change of mixing material and equalization between the two troughs 61 and 62. Expensive control mechanisms are thus, not necessary so that the housing of solid construction is more than compensated, not the least by the fact that a very stable and safe machine is obtained.

In a single shaft press according to the invention, only one part of the drive, for example, a belt pulley, can be flanged directly to the door 20, particularly when the food to be produced does not change or only changes at very long intervals. Likewise the various methods of heating or cooling or maintaining a vacuum, etc. can be combined as desired.

In the embodiment of the invention shown in FIG. 10 the housing generally designated 110 includes a mixing chamber part 71 and a combined kneading part and pressure part 70 which is hinged thereto at a hinge 72. A shaft 112 includes a mixing part 73 rotatable within the mixing chamber part 71 and a pressing part 80 which is secured thereto and which will rotate in a conical part 114, when the part 70 is returned to an axially aligned position. The shaft 112 is connected through a coupling 74 with a drive shaft 75. The pressing shaft portion 77 may be disengaged from the remaining shaft portions by disengaging a squared end 78 from a corresponding recess or seat 79 defined at the outer end of the pressing part 80.

In FIG. 11 there is shown a single shaft press which includes a cylindrical press part 120 made up of two individual lengths 80 and 82 which are pivoted together at 81 and which may be clamped in an axially aligned position by clamping bolts 87 engaging through flange portions 86 and 86'. Each jacket 80 and 82 is provided with an inner cylinder part 83, 83' and an outer cylin-

der part 84, 84' which define an annular cavity for heat exchange media. Each part is provided with a flange 85, 85' for fastening the other housing parts of the press mold thereto.

Particularly in the processing of certain snacks, where the total length of the kneading and pressing parts and hence the jacket parts as well as the screw shaft contained therein, is frequently over 2 meters, but generally in relation to long press cylinders, there is an enormous advantage for the production as well as the sanitary operation of such an arrangement, despite the attached parts. The jacket parts 80 and 82 can be provided with different heat exchange media, for example, jacket part 80 can be heated and jacket part 82 cooled.

During the processing the kneading and the pressing shaft can always be removed for cleaning to make sure, by visual inspection, that they are, in fact, clean. Same holds true for the jacket parts 80 and 82, since the jacket part 82 is simply opened like a door by pivoting it about the vertical hinge, and 81 is shown in FIG. 11. The cleaning and the visual inspection are thus considerably facilitated without heavy and long parts having to be moved by a crane, for example.

A particular advantage is that the jacket part 82 can be removed and replaced directly by a door type press mold retaining head 33 having the same connections. The machine, according to the invention, can thus be fitted better into an existing assembly of prefabricated parts.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A combined mixer, kneader and presser for materials particularly for forming foods such as pasta, comprising a housing having a wide diameter mixing portion, a small diameter pressing portion and an intermediate kneading portion connected between said mixing portion and said pressing portion, said mixing portion having an inlet for materials to be treated, said pressing portion having a free end opposite to said kneading portion with a discharge for the material, drive means connected to said housing adjacent said mixing portion of said housing, at least one shaft connected to said drive means and rotated thereby and extending axially through said housing, said shaft having a mixing portion with arm means rotatable in said mixing portion of said housing, a kneading portion rotatable in said kneading portion of said housing and a pressing portion rotatable in said pressing portion of said housing, said housing having a door formation adjacent at least one end of said mixing portion thereof comprising a hinge connection including a portion fixed in respect to said drive means and a portion which may be swung outwardly to one side of said fixed portion to facilitate access to the interior of said housing for removal and cleaning of said shaft.

2. A combined mixer, kneader and presser according to claim 1, wherein said shaft kneading portion comprises a conically shaped core having a widened end in said mixing portion of said housing and an inwardly tapered smaller diameter end connected to said shaft pressing portion and a spirally progressing screw for-

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mation extending outwardly from the surface of said core.

3. A combined mixer, kneader and presser according to claim 1, wherein said shaft kneading portion is tapered in the direction of movement of the material.

4. A combined mixer, kneader and presser according to claim 1, wherein said mixing portion of said housing is sealed in respect to the outside so that it may be maintained at a pressure which is distinct from the surrounding atmosphere.

5. A combined mixer, kneader and presser according to claim 1, including a material feed line connected to said inlet, a high speed mixer arranged in said feed line and including a driving motor, and a rotatable shaft driven by said motor in said mixer having arm means for mixing material therein.

6. A combined mixer, kneader and presser according to claim 1, including a pump connected to said mixing portion of said housing for regulating the pressure within said housing.

7. A combined mixer, kneader and presser according to claim 1, including means associated with said housing for selectively and alternatively heating and cooling portions of said housing.

8. A combined mixer, kneader and presser according to claim 1, including a feed line connected into said inlet, a dosing lock connected to said feed line through which the material is passed including a rotatable vane element therein, and means for rotating said vane to provide a regulated feed to said mixing portion of said housing.

9. A combined mixer, kneader and presser according to claim 1, including a mounting base for supporting said housing, said fixed portion of said housing being secured to said mounting base and including said drive means, said drive means comprising a transmission connected to said shaft and a motor connected to said transmission to drive said shaft.

10. A combined mixer, kneader and presser according to claim 1, wherein said kneading portion of said shaft comprises a frustroconical core portion with an outwardly extending progressing screw thread which is spaced inwardly from the interior wall of said intermediate conical kneading portion of said housing.

11. A combined mixer, kneader and presser according to claim 10, wherein said inlet is connected centrally between said mixing portion and said additional mixing portion of said housing and comprises the only feed for both of said portion.

12. A combined mixer, kneader and presser according to claim 1, wherein there is said at least one shaft

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comprises a pair of parallelly arranged laterally spaced shafts, said housing including a substantially identical additional mixing chamber portion, intermediate portion and pressing portion arranged in parallel relationship with the mixing chamber portions being interconnected centrally.

13. A combined mixer, kneader and presser according to claim 11, wherein said feed opening for said mixing portions for said housing is arranged centrally between said mixing portion and said additional mixing portion and extends substantially perpendicular to the axes thereof.

14. A combined mixer, kneader and presser according to claim 1, wherein said shaft presser portion comprises a rotatable press screw and an extension within a hollow portion of said kneading portion and said mixing portion of said shaft, said pressing portion of said shaft having means at the end of said extensive portion for coupling said shaft to said drive means.

15. A combined mixer, kneader and presser according to claim 1, wherein said pressing portion of said housing comprises at least two separate longitudinally extending portions which are hinged together and which may arranged in longitudinally extending axial alignment or broken apart and pivoted about the hinge portion to open them up.

16. A combined mixer, kneader and presser according to claim 1, wherein said housing door formation is located between said mixing portion of said housing and said drive means.

17. A combined mixer, kneader and presser according to claim 1, wherein said housing door formation is located between said mixing portion of said housing and said intermediate portion of said housing.

18. A combined mixer, kneader and presser according to claim 1, wherein said kneading portion and said mixing portion of said shaft comprise a single hollow piece, said pressing portion of said shaft comprising a press screw formation rotatable in said housing pressing portion and an extension extending through the hollow portion of said kneading portion and said mixing portion of said shaft and means for coupling said mixing portion and said kneading portion and said pressing portion to said drive means.

19. A combined mixer, kneader and presser according to claim 18, wherein said coupling means comprises a squared end of said presser shaft, said drive means including a recess squared end engagable with said squared end of said presser shaft.

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