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Description

Field of the invention

This invention relates to the processing of soap-containing feedstocks to harden tha soap product in bar or other solid form.

Background to the invention

Soap bars and other solid forms are required to have a hardness which allows them to maintain their physical integrity during manufacture, packing and use. A bar or other solid form below the satisfactory level may deform and may be marked by handling after manufacture.

Examples of bars which are liable to softness include those having a high proportion of unsaturated feedstocks e.g. tallow, soya and palm, and those containing a relatively high level of water (ca 13% and higher). The high level of water may be present to provide optimum properties relating to another component. The present invention achieves hardening of the soap material by subjecting it to considerable working within a specific temperature range in an efficient manner, the temperature range being sensitive to composition.

General description

The present invention uses a device of the cavity transfer mixer class to work the soap base. These devices comprise two closely spaced mutually displaceable surfaces each having a pattern of cavities which overlap during movement of surfaces so that material moved between the surfaces traces a path through cavities alternately in each surface so that the bulk of the material passes through the shear zone generated in the material by displacement of the surfaces.

Cavity transfer mixers are normally prepared with a cylindrical geometry and in the preferred devices for this process the cavities are arranged to give constantly available but changing pathways through the device during mutual movement of the two surfaces. The devices having a cylindrical geometry can comprise a stator within which is journalled a rotor; the opposing faces of the stator and rotor carry the activities through which the material passes during its passage through the device.

The device may also have a planar geometry in which opposed plane surfaces having patterns of cavities would be moved mutually, for example by rotation of one plane, so that material introduced between the surfaces at the point of rotation would move outwards and travel alternately between cavities on each surface.

Another form of cylindrical geometry maintains the inner cylinder stationary while rotating the outer cylinder. The central stator is more easily cooled, or heated if required, because the fluid connections can be made in a simple manner; the external rotor can also be cooled or heated in a relatively simple manner. It is also mechanically simpler to apply rotational energy to the external body rather than the internal cylinder. Thus the configuration has advantages in construction and use.

Material is forced through the mixer using auxiliary equipment as the rotor is turned. Examples of the auxiliary equipment are screw extruders and piston rams. The auxiliary equipment is preferably operated separately from the mixer so that the throughput and work performed on it can be separately varied. The separate operation may be achieved with the auxiliary equipment arranged to provide material for processing at an angle to the centre line of the shear-producing device. This arrangement allows rotational energy to be supplied to the device around its centre line. An in-line arrangement is more easily achieved when the external member of the device is the rotor. Separate operation of the device and the auxiliary equipment assists in providing control of the processing.

In general a variety of cavity shapes can be used, for example Metal Box (GB—A—930 339) disclose longitudinal slots in the two surfaces. The stator and rotor may carry slots, for example six to twelve, spaced around their periphery and extending along their whole length.

EP—A—0 048 590 describes a specific form of cavity transfer mixer and suggests its application in soap processing.

There are six applications directed to detergent processing copending with the present application. EP—A—0 090 644 (83301762.7) describes the processing of a superfatted soap formulation to improve the properties. EP—A—0 090 646 (83301764.3) describes the processing of soap compositions to reduce grittiness. EP—A—0 090 647 (83301765.0) describes the incorporation of a volatile component in a soap composition. EP—A—0 090 649 (83301767.6) describes the manufacture of a transparent soap composition. EP—A—0 090 648 (83301766.8) describes the aeration of a detergent formulation and EP—A—0 090 650 (83301768.4) describes the control of phases in soap containing compositions.

Preferably one or both surfaces are subjected to thermal control. The process allows efficient heating/cooling of the material to be achieved.

Preferably the temperature of the material during processing is in the range from about 30°C to about 55°C, preferably up to 50°C.

The soap feedstock may contain non-soap detergents in amounts which do not interfere with the desired effect. Examples of these actives are alkane sulphonates, alcohol sulphates, alkyl benzene sulphonates, alkyl sulphates, acyl isethionates, olefin sulphonates and ethoxylated alcohols.

The processed feedstock was made into bar form using standard stamping machinery. Other solid product forms, e.g. extruded particles (noodles) and beads can be prepared from the feedstock.

Drawings:

The invention will be described with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a longitudinal section of a cavity transfer mixer with cylindrical geometry;

Figure 2 is a transverse section along the line II—II on Figure 1;

Figure 3 illustrates the pattern of cavities in the device of Figure 1;

Figures 4, 5 and 7 illustrate other patterns of cavities;

Figure 6 is a transverse section through a mixer having grooves in the opposed surfaces of the device;

Figure 8 is a longitudinal section of a cavity transfer mixer in which the external cylinder forms the rotor.

Specific description of devices

Embodiments of the devices will now be described.

A cavity transfer mixer is shown in Figure 1 in longitudinal section. This comprises a hollow cylindrical stator member 1, a cylindrical rotor member 2 journalled for rotation within the stator with a sliding fit, the facing cylindrical surfaces of the rotor and stator carrying respective pluralities of parallel, circumferentially extending rows of cavities which are disposed with:

a) the cavities in adjacent rows on the stator circumferentially offset;

b) the cavities in adjacent rows on the rotor circumferentially offset; and

c) the rows of cavities on the stator and rotor axially offset.

The pattern of cavities carried on the stator 3 and rotor 4 are illustrated on Figure 3. The cavities 3 on the stator are shown hatched. The overlap between patterns of cavities 3, 4 is also shown in Figure 2. A liquid jacket 1A is provided for the application of temperature control by the passage of heating or cooling water. A temperature control conduit 2A is provided in the rotor.

The material passing through the device moves through the cavities alternately on the opposing faces of the stator and rotor. The cavities immediately behind those shown in section are indicated by dotted profiles on Figure 1 to allow the repeating pattern to be seen.

The material flow is divided between pairs of adjacent cavities on the same rotor or stator face because of the overlapping position of the cavities on the opposite stator or rotor face.

The whole or bulk of the material flow is subjected to considerable working during its passage through the shear zone generated by the mutual displacement of the stator and rotor surfaces. The material is entrained for a short period in each cavity during passage and thus one of its velocity components is altered.

The mixer had a rotor radius of 2.54 cm with 36 hemispherical cavities (radius 0.9 cm) arranged in six rows of six cavities. The internal surface of the stator carried seven rows of six cavities to provide cavity overlap at the entry and exit. The material to be worked was injected into the device through channel 5, which communicates with the annular space between the rotor and stator, during operation by a screw extruder. The material left the device through nozzle 6.

Figure 4 shows elongate cavities arranged in a square pattern; these cavities have the sectional profile of Figure 2. These cavities are aligned with their longitudinal axis parallel to the longitudinal axis of the device and the direction of movement of material through the device; the latter is indicated by the arrow.

Figure 5 shows a pattern of cavities having the dimensions and profile of those shown in Figures 1, 2 and 3. The cavities of Figure 5 are arranged in a square pattern with each cavity being closely spaced from four adjacent cavities on the same surface. This pattern does not provide as high a degree of overlap as given by the pattern of Figure 3. The latter has each cavity closely spaced to six cavities on the same surface, i.e. a hexagonal pattern.

Figure 6 is a section of a cavity transfer mixer having a rotor 7 rotatably positioned within the hollow stator 8 having an effective length of 10.7 cm and a diameter of 2.54 cm. The rotor carried five parallel grooves 9 of semi-circular cross section (diameter 5 mm) equally spaced around the periphery and extending parallel to the longitudinal axis along the length of the rotor. The inner cylindrical surface of the stator 8 carried eight grooves 10 of similar dimensions extending along its length and parallel to the longitudinal axis. This embodiment, utilised cavities extending along the length of the stator and rotor without interruption. A temperature control jacket and its conduit were present.

Figure 7 shows a pattern of cavities wherein the cavities on the rotor, shown hatched, and stator have a larger dimension normal to the material flow; the latter is indicated by an arrow. The cavities are thus elongate. This embodiment provides a lower presence drop over its length compared with devices of similar geometry but not having cavities positioned with a longer dimension normal, i.e. perpendicular to the material flow. To obtain a reduction in pressure drop at least one of the surfaces must carry elongate cavities having their longer dimension normal to the material flow.

The cavity transfer mixer of Figure 8 had the external cylinder 11 journalled for rotation about the central shaft 12. Temperature control jacket 13 and conduit were present but the latter is not shown because the cavities on the central shaft are shown in plan view while the rotor is sectioned. The central stator (diameter 52 mm) had three rows 14 of three cavities with partial, i.e. half cavities at the entry and exit points. On the rotor there were four rows 15 of three cavities. The cavities on the stator and rotor were elongate with a total arc dimension of 51.1 cm normal to the material flow with hemispherical section ends of 1.2 cm radius joined by a semicircular sectioned panel of the same radius. The cavities were arranged in the pattern of Figure 7, i.e. with their long dimension normal to material flow. The rotor was driven by a chain drive to external toothed wheel 16.

Examples

Examples of the process of the invention will now be given. The cavity transfer mixer illustrated in Figure 1 was used.

The mixer had a rotor radius of 2.54 cm with 36 hemispherical cavities (radius 0.9 cm) arranged in six rows of six cavities. The internal surface of the stator carried seven rows of six cavities to provide cavity overlap at the entry and exit.

The temperatures used for processing the feedstocks to provide the designed hardening will be dependent on the composition used.

Example I

Tallow fat was saponified, washed, fitted and vacuum dried to 20% moisture. The chips were then extruded through the device with the aid of a soap plodder. The hardness was measured with a SUR (Berlin) penetrometer using a 9° conical needle under a total force of 200 g for 10 seconds. Cooling water was applied to the stator and rotor. The results are given in the Table I.

Example II

A soap feedstock comprising tallow 76% coconut 12% and soya bean oil 12% was prepared at a moisture content of 16.5%. The feedstock was processed as in Example I and the hardness measured.

Example III

A feedstock of tallow/coconut 80/20 was prepared and the moisture increased to 18% by cold milling in additional water. The feedstock was processed as in Example I and the hardness measured.

TABLE I

Example	Rotor speed (rpm in)	Through-put g min^{-1}	Penetration (mm)		Temperature (°C)	
			Initial	Final	Inlet	Outlet
I	95	290	5.2	4.2	36.0	42.0
II	95	380	4.8	4.2	42.0	43.0
III	120	520	4.3	3.7	32.0	47.0

The treatment of these feedstocks thus produced a hardening of the bars.

Examples IV to VIII

These examples utilised a cavity transfer mixing device with cavities of diameter 2.4 cm arranged circumferentially.

Eight cavities on the stator and seven cavities plus half cavities at each end on the rotor were present on the components shown in Figure 1. Water cooling was applied to the stator and rotor. The formulations, which had a relatively high water content and which contained feedstocks providing physically soft bars, are given in Table II. The results are quoted in Table III. The feedstock oils and fats are quoted as percentages of the fat charge.

TABLE II

Example	IV	V	VI	VII	VIII
Feedstock					
Tallow	85	80	87.5	—	—
Babassu	10	15	7.5	—	—
Soya	5	5	5	—	—
Palm	—	—	—	85	—
Palm kernel	—	—	—	15	—
Hardened rice bran	—	—	—	—	42
Castor olein	—	—	—	—	42
Coconut	—	—	—	—	15
Rosin	—	—	—	—	1
Moisture	15	16.5	16	17	14

TABLE III

Example	Rotor speed (rpm)	Through-put g min^{-1}	Penetration (mm)		Temperature (°C)	
			Initial	Final	Inlet	Outlet
IV	30	200	2.7	1.6	29	43
V	30	280	2.6	1.9	29	50
VI	30	240	3.2	2.3	28	50
VII	30	260	2.9	2.0	29	50
VIII	30	360	2.5	2.4	30	50

Claims

1. The process for hardening soap-containing detergent material for bars and other solid forms in which a physically soft soap-containing feedstock material is subjected to working by passing the material between two closely spaced mutually displaceable surfaces each having a pattern of cavities which overlap during movement of the surfaces so that the material moved between the surfaces traces a path through cavities alternately in each surface, whereby the bulk of the material passes through the shear zone generated in the material by displacement of the surfaces and the material is produced as bars or other solid forms.

2. A process according to Claim 1 wherein the two surfaces have cylindrical geometry.

3. A process according to Claim 1 or 2 wherein thermal control is applied to at least one surface.

4. A process according to any preceding claim wherein the cavities in at least one surface are elongate with their long dimension normal to the flow of material.

5. A process according to any preceding claim wherein the temperature of the soap-containing material during processing is in the range from about 30°C to about 55°C.

6. A process according to claim 5 wherein the temperature is up to 50°C.

7. A process according to any preceding claim wherein the physically soft properties derive from the presence of unsaturated feedstock or a water content of above about 13%.

Patentansprüche

1. Verfahren zum Härten von Seife-enthaltendem Detergensmaterial für Stücke und andere feste Formen, worin ein körperlich weiches Seife-enthaltendes Ausgangsmaterial einer Bearbeitung unterzogen wird, worin das Material zwischen zwei benachbart angeordneten, wechselseitig versetzbaren Oberflächen

durchgeleitet wird, wobei jede ein Muster von Hohlräumen hat, die sich während der Bewegung der Oberflächen so überlappen, daß das zwischen den Oberflächen bewegte Material einen Weg durch die Hohlräume wechselseitig in jeder Oberfläche findet, wobei die Masse des Materials durch die Scherzone gelangt, die in dem Material durch Versetzung der Oberflächen erzeugt wird, und das Material in Form von Stücken oder in anderen festen Formen hergestellt wird.

2. Verfahren nach Anspruch 1, worin die zwei Oberflächen zylindrische Geometrie haben.

3. Verfahren nach Anspruch 1 oder 2, worin Wärmeregelung an mindestens einer Oberfläche angewendet wird.

4. Verfahren nach einem der vorhergehenden Ansprüche, worin die Hohlräume in mindestens einer Oberfläche verlängert sind mit ihrer langen Ausdehnung senkrecht zu dem Materialfluß.

5. Verfahren nach einem der vorhergehenden Ansprüche, worin die Temperatur des Seife-enthaltenden Materials während der Bearbeitung in dem Bereich von etwa 30°C bis etwa 55°C liegt.

6. Verfahren nach Anspruch 5, worin die Temperatur bis zu 50°C beträgt.

7. Verfahren nach einem der vorhergehenden Ansprüche, worin die körperlich weichen Eigenschaften von der Gegenwart von ungesättigtem Ausgangsmaterial oder einem Wassergehalt von über etwa 13% herstammen.

Revendications

1. Procédé pour durcir un matériau détergent contenant un savon pour former des barres ou d'autres formes solides, dans lequel une matière première physiquement molle contenant un savon est soumise à un travail par passage du matériau entre deux surfaces rapprochées pouvant se déplacer l'une par rapport à l'autre comportant chacune un dessin de cavités qui se recouvrent au cours du mouvement des surfaces de manière que le matériau en mouvement entre les surfaces suive un passage à travers les cavités alternativement dans chaque surface, de telle sorte que la masse du matériau traverse la zone de cisaillement créée dans le matériau par le déplacement des surfaces et que le matériau est produit sous forme de barres ou sous d'autres formes solides.

2. Procédé selon la revendication 1, dans lequel les deux surfaces ont une géométrie cylindrique.

3. Procédé selon la revendication 1 ou 2, dans lequel on applique une régulation thermique sur l'une des surfaces au moins.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel les cavités dans l'une des surfaces au moins sont allongées en ayant leur grande dimension normale à la direction de l'écoulement du matériau.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel la température du matériau contenant un savon au cours du traitement est d'environ 30°C à environ 55°C.

6. Procédé selon la revendication 5, dans lequel la température va jusqu'à 50°C.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel les propriétés de mollesse physique proviennent de la présence de matière première insaturée ou d'une teneur en eau supérieure à environ 13%.

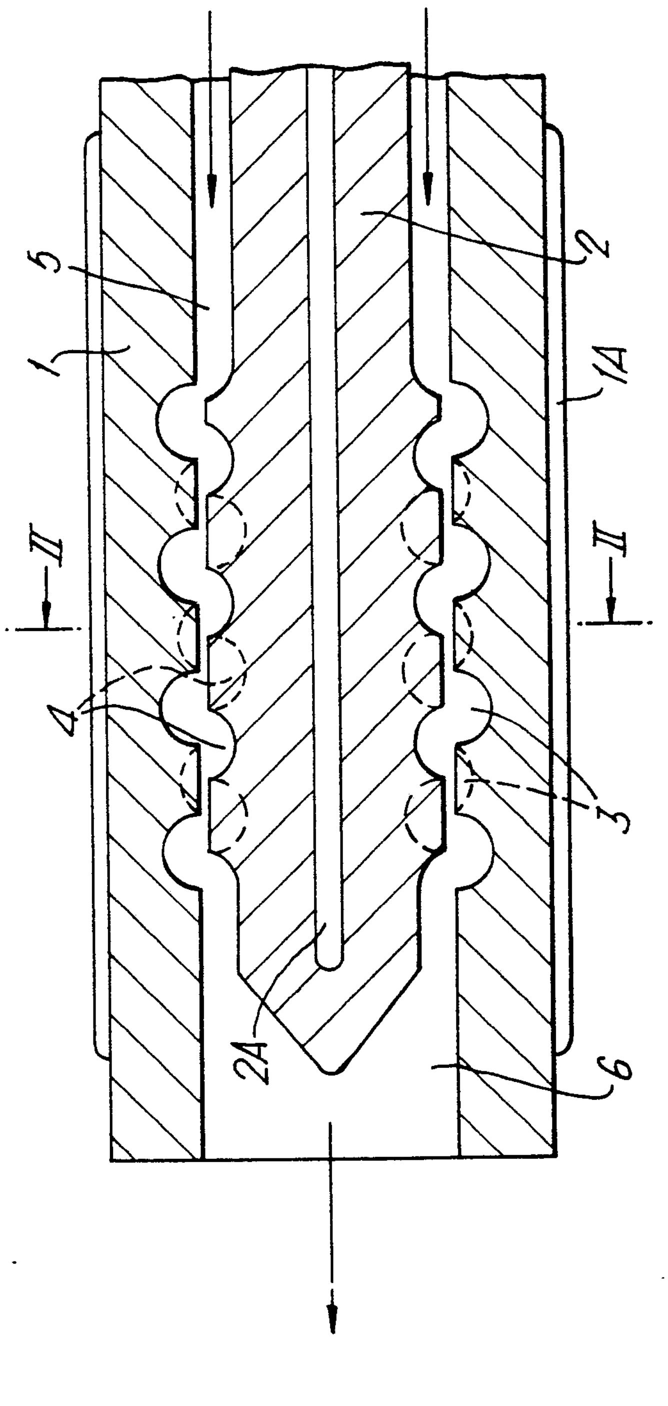

Fig.1.

Fig.2.

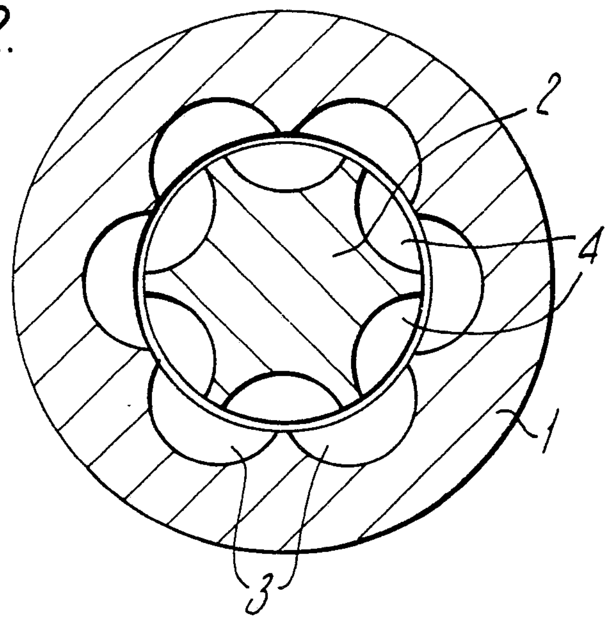

Fig.3.

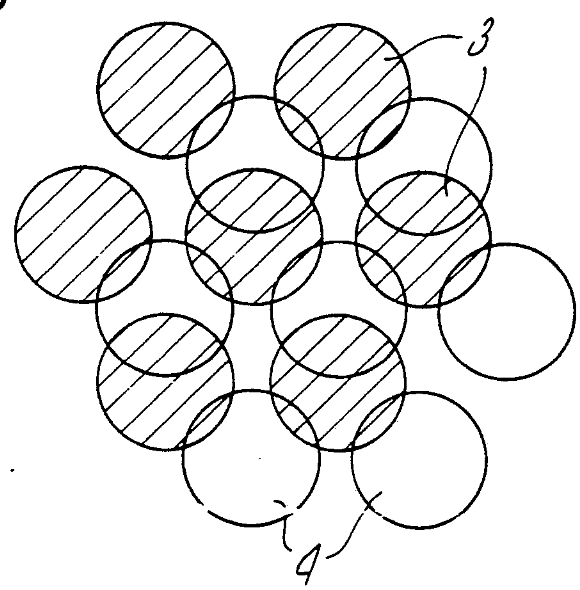

Fig.4.

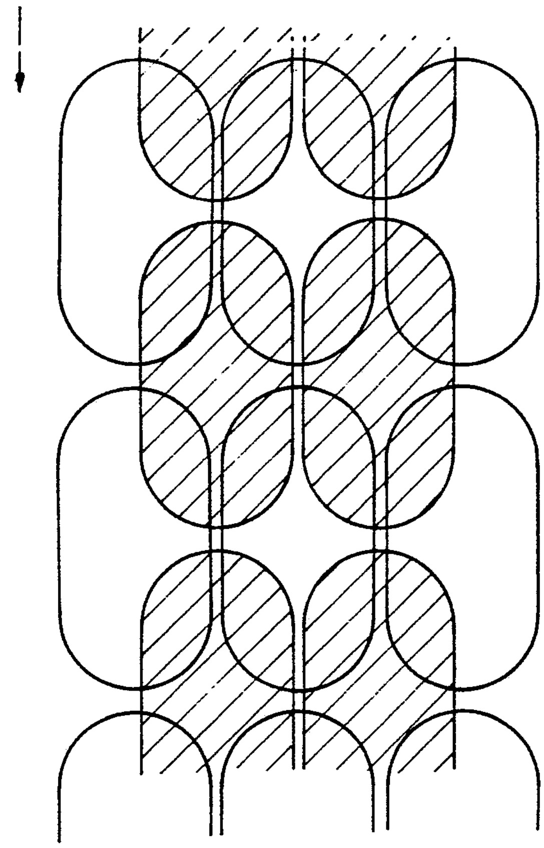

Fig. 5.

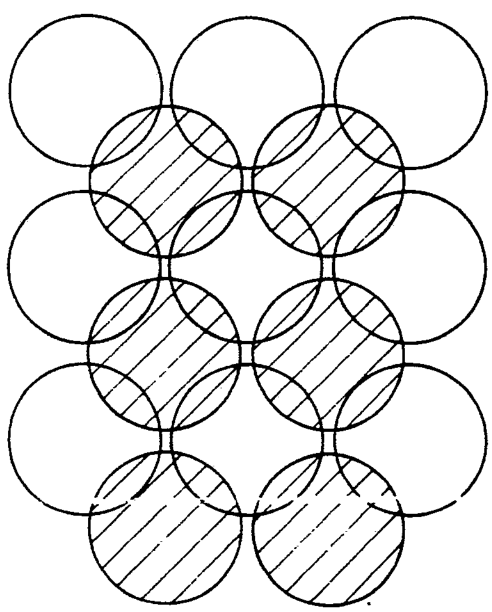

Fig.6.

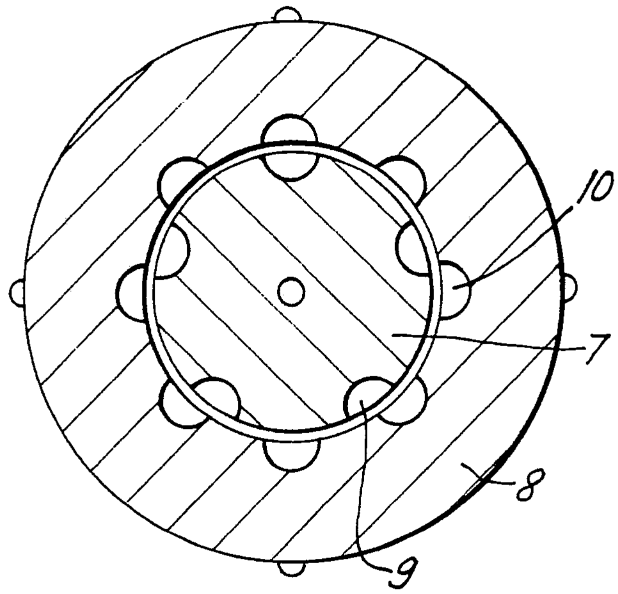

Fig.7.

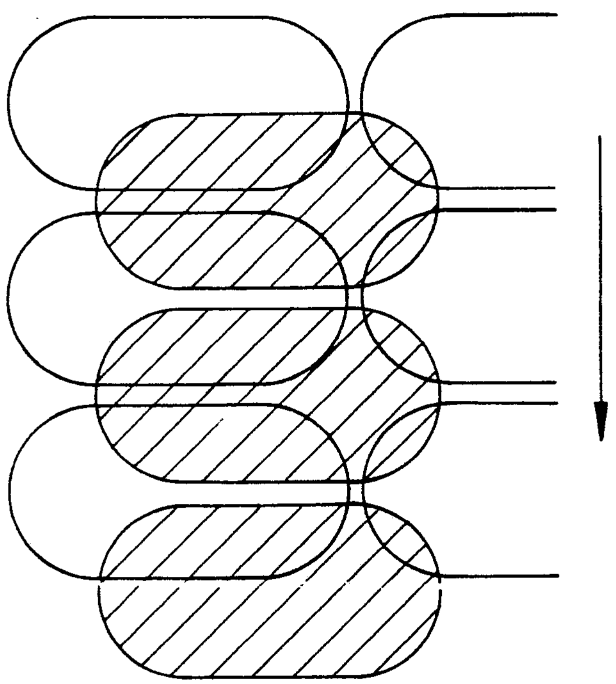

Fig. 8.