****

PALLMANN PLAST-AGGLOMERATION SYSTEM

****

PAPER PRESENTED BY:

JEFFREY G. BASSETT

FI-TECH, INC.

THERMOPLASTIC WASTE RECLAMATION

DECEMBER 4-5, 1991

HOLIDAY INN-WOODLAWN * CHARLOTTE, NC

Pallmann Plast-Agglomeration System

Due to the rising cost and continuing concerns over the long term environmental effects of waste disposal, recycling has become a key emphasis in the Thermoplastics Industry. Specifically, more and more synthetic fiber producers are establishing corporate recycling policies for the handling of the various polymer wastes created during manufacturing. These can include start-up wastes, purgings, off-quality product or product created during process changes. For this reason, synthetic fiber wastes can come in many forms. In order for this material to be reused, it must be converted. Therefore, the key objective for any recycling system used by synthetic fiber producers is that it converts the normally low bulk density wastes into high bulk density free flowing granules.

The first step to any successful recycling program is the implementation of a system that facilitates the collection of the various wastes, prevents these wastes from becoming contaminated with foreign material, and transports the wastes to a processing location. An important factor in the successful implementation of this system or any recycling system is education. The recycling program's success is directly related to the familiarity of all employees with the program and their understanding of the importance of handling the waste material properly. Once this procedure is established, the various synthetic fiber wastes must be processed to become reusable.

Specifically, there are two methods for converting the fiber wastes into high bulk density free flowing granules. These are agglomeration (densification) or re-extrusion. During the conversion process, it is best to stress the polymeric material as little as possible. This is necessary in order to prevent any change in the material properties. The agglomeration system tends to minimize the amount of thermal stress on the processed material due to the nature of the process. Pallmann Pulverizers Co., Inc. of Clifton, NJ, engineers and builds such systems using the agglomeration process.

The Pallmann Plast-Agglomeration system normally consists of the following components:

1. Pre-Cutter
2. Primary Knife Mill
3. Plast-Agglomerator (Densifier)
4. Hot Granulator
5. Cascade Sifter
6. Cooling System
7. Collection of Final Product

1. Pre-Cutter: This unit is not always required for all applications; however, when using baled material, it will produce a more consistent even feed to the primary knife mill. Often, the pre-cutter will be a guillotine cutter operating at one end of a feed trough. The waste material is dumped from storage bins into the feed trough. A ram feed then presses the waste into the vertical movement of the guillotine knife. The knife slices off a designated amount of material. The pre-cut waste can then be fed by different methods into the primary knife mill.

2. Primary Knife Mill: Normally for synthetic fiber wastes, Pallmann recommends a specially developed knife mill which uses a guillotine style open rotor. With this type mill, the rotating knives are mounted on a carriage that has no center shaft. This system reduces the amount of friction generated in the cutting chamber, thereby reducing the heat generated. Also, this system prevents any of the fiber waste from wrapping around the carriage and exerting excess stress on the shaft bearings. Another added advantage is that this type of knife mill will not stall as easily as other traditional granulators when they are overfed. A screen located at the bottom of the knife mill determines the final size of the cut material.

3. Plast Agglomerator: The cut material is pneumatically conveyed by air to the feed hopper of the agglomerator. If necessary, a storage bin with a larger capacity can receive the material from the knife mill. The material is then conveyed to the agglomerator as required. The feed hopper on the agglomerator is equipped with agitators to prevent bridging, and a variable rate feed screw removes the material from the bottom of the hopper. Once exiting the hopper, the material is then transferred to a constant rate feed screw which feeds the densifying chamber. The densification occurs when the feed material is pressed against the inside of a ring die by rotating turbo blades. The material is heated by the friction and compressed into the die center. As the waste heats up, it begins to jell and pass through the holes in the ring die. Planetary knives rotating on the outside of the ring die scrape the densified material from the outside of the ring die as it is pressed through the holes. Ambient air is introduced by a blower in order to cool the material and transport it to the hot granulator. The Plast-Agglomerator operates below the melting point of the thermoplastic in order to reduce the thermal stress on the material. A water jacket around the densification chamber allows for control of the operating temperature. Also, any fumes coming from the chamber are vented from the machine.

4. Hot Granulator: The densified material coming from the agglomerator tends to stick together or form long strands. Therefore, it is necessary to process it in the hot granulator. The Hot Granulator has an open style rotor and water cooled in-feed to reduce the amount of heat created during operation. The screen at the bottom of the granulator gives the densified material its final size. The cut material is then conveyed by air to the Cascade Sifter.

5. Cascade Sifter: The purpose of the sifter or gravity separator is to remove the fine particles from the material stream. Often these fines become statically charged, and they can fall into the final product as clumps unless removed. The cascade sifter allows the fines to be separated from the coarser desired granules. The fines are returned to the Plast-Agglomerator for reprocessing.

6. Cooling System: Some thermoplastics tend to retain heat more so than others. Therefore, in these cases additional cooling is necessary before final collection can take place. The additional cooling is accomplished by placing the granules in a cylindrical chamber equipped with air locks at the entrance and exit. Cool air is introduced at the bottom, and as the granules enter from the top, they are cooled by the upward air flow. Level indicators discharge the product automatically through the discharge air lock.

7. Collection of Final Product: At this point the final product can be collected in sacks, gaylord containers or silos. It is ready for use in a variety of ways.

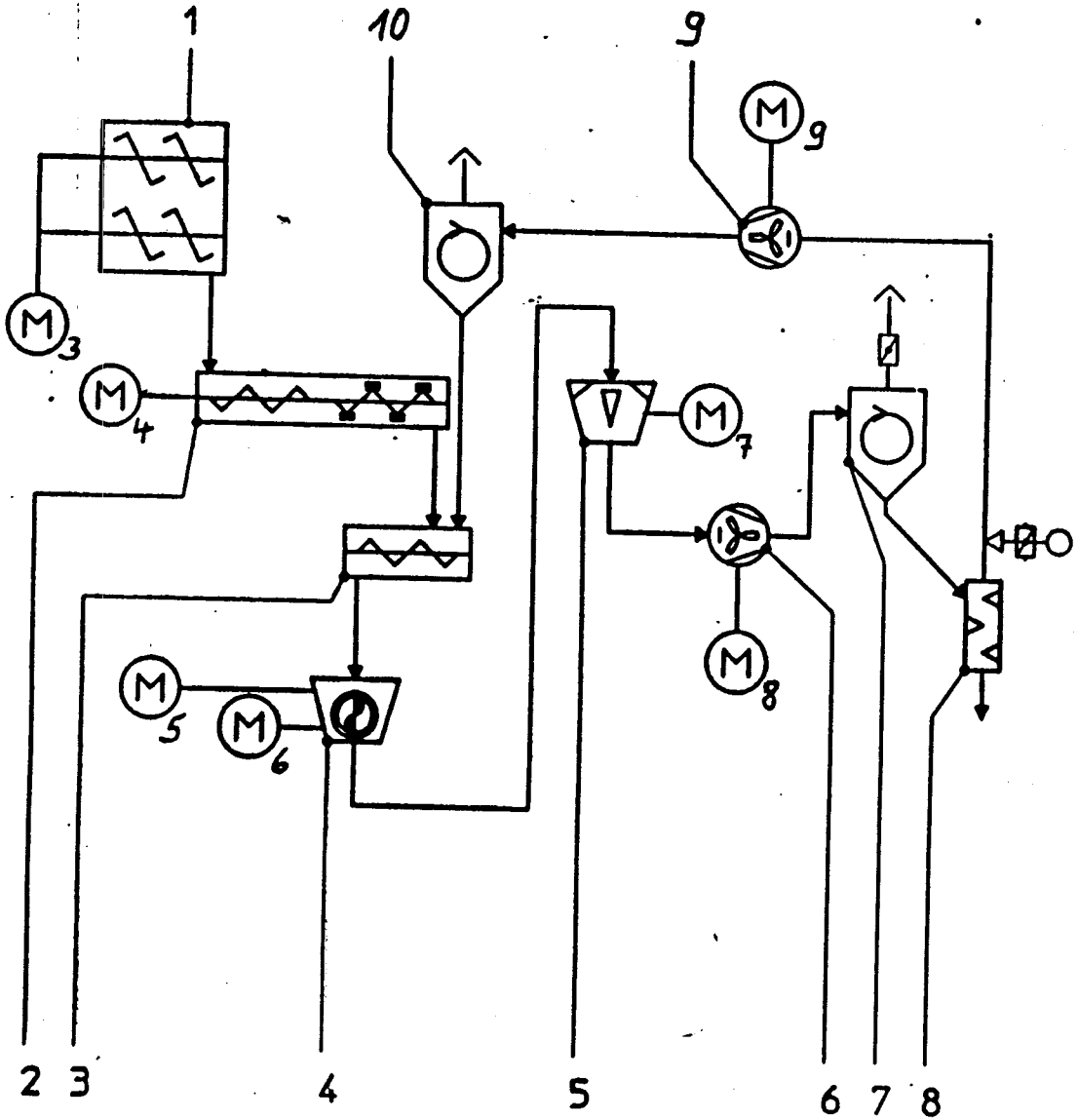
The product obtained from the Pallmann Plast-Agglomeration system can be used in different ways. Two main applications are that it can be sold to injection molders or it can be reused by the extruder. As far as selling the product is concerned, many domestic fiber producers have developed steady markets for their reclaimed material. If reuse is the extruder's goal, the reclaim can be metered in as a certain percentage with virgin material. In some cases, fiber producers have made products from 100% densified material. However, the reclaim is normally metered in with virgin material at low percentages.

PALLMANN
ZERKLEINERUNGSMASCHINEN
ZWEIBRÜCKEN

Plastagglomeratoranlage

Plast-Agglomerator-Installation

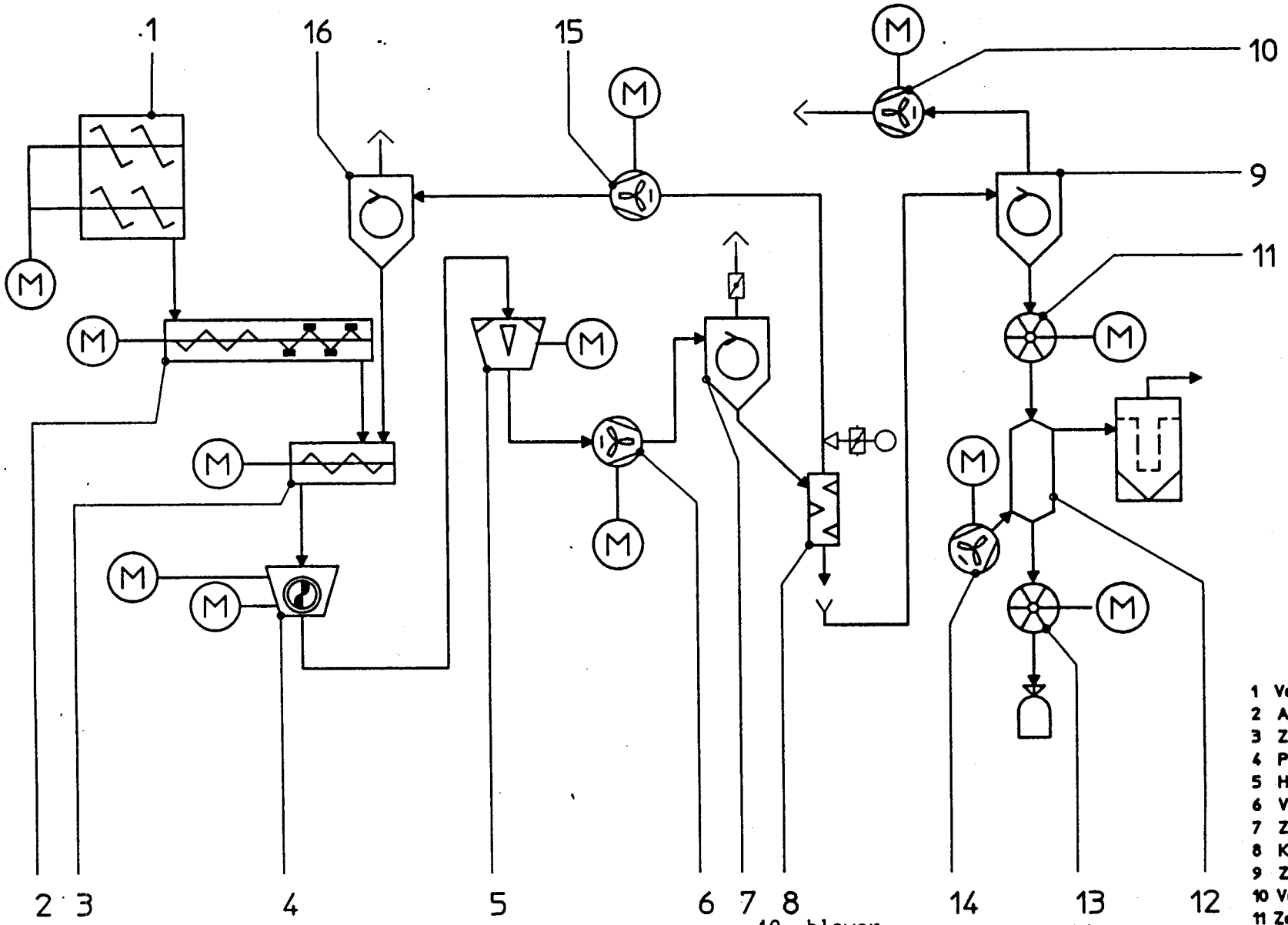
DATUM
Fließschema
Flowsheet
Schema
23.7.70



1 hopper with stirrer
2 discharge screw with paddle screw
3 feeding screw
4 Plast Agglomerator
5 Hot Granulator
6 Blower
7 Cyclone
8 cascade sifter
9 blower
10 cyclone

PALLMANN
ZERKLEINERUNGSMASCHINEN
ZWEIBRÜCKEN

Plastagglomeratoranlage



1. hopper with stirrer
2. discharge screw with paddle screw
3. feeding screw
4. Plast Agglomerator

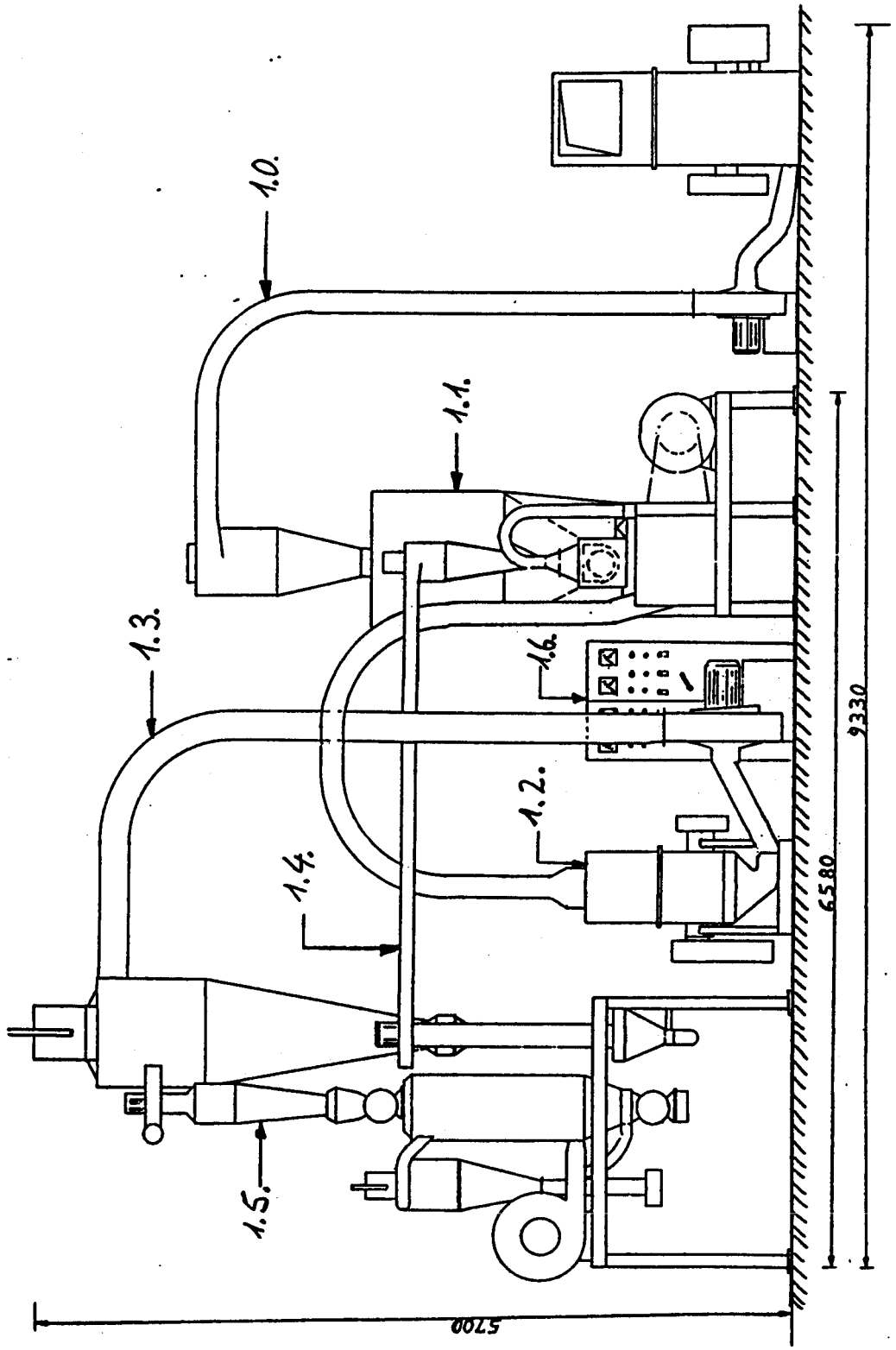
5. Hot Granulator
6. blower
7. cyclone
8. cascade sifter
9. cyclone

10. blower
11. air lock
12. granules cooler
13. air lock
14. blower

15. blower
16. cyclone

1 Vorratsbehälter mit Rührwerk
2 Austrageschnecke mit Paddelsch
3 Zuführschnecke
4 Plastagglomerator
5 Heißgranulator
6 Ventilator
7 Zyklon
8 Kaskadensichter
9 Zyklon
10 Ventilator
11 Zellenradschleuse
12 Granulatkühler
13 Zellenradschleuse
14 Ventilator
15 Ventilator
16 Zyklon

Layout sketch PFV 250



Depth of the installation: 2.400 mm

Description of the individual positions on layout sketch PFV 250

-x-x-x- PALLMANN PLASTAGGLOMERATOR -x-x-x-
-x-x-x- type PFV 250/40 -x-x-x-

position	Description
1.0	Precutting knife mill type PS with drive motor, fan, piping and cyclone.
1.1	Hopper with agitators, discharge- and paddle screw.
	Plast Agglomerator type PFV with feed screw, drive components and machine base.
	Main drive motor for PFV
1.2	Hot granulator type PSHG with feed chute, material pick-up pan, machine base and main drive motor.
1.3	Fan, piping, cyclone
1.4	Gravity separator with fan and base.
	Fines return with piping and cyclone.
1.5	Granule conveying system incl. piping, cyclone and fan
	Granule cooler with 2 air locks, fan and base.
1.6	Switch- and control panel

Pallmann Plast-Agglomerator type PFV

Sales arguments

Technical advantages:

Exact temperature control due to the cooling system in the agglomerating chamber area.

No direct contact between material and cooling water.

Controlled material flow due to load controlled material feeding.

Carefull processing due to short temperature cycles.

Granule size can be modified by selecting different screen sizes.

Installation can be started from cold condition without cleaning required.

Other advantages:

Material treatment with minimum degradation.

High throughput rates.

Final granules with high bulk density.

Good flowability.

Continous production (no batch type operation)

Fast amortization and cost savings.

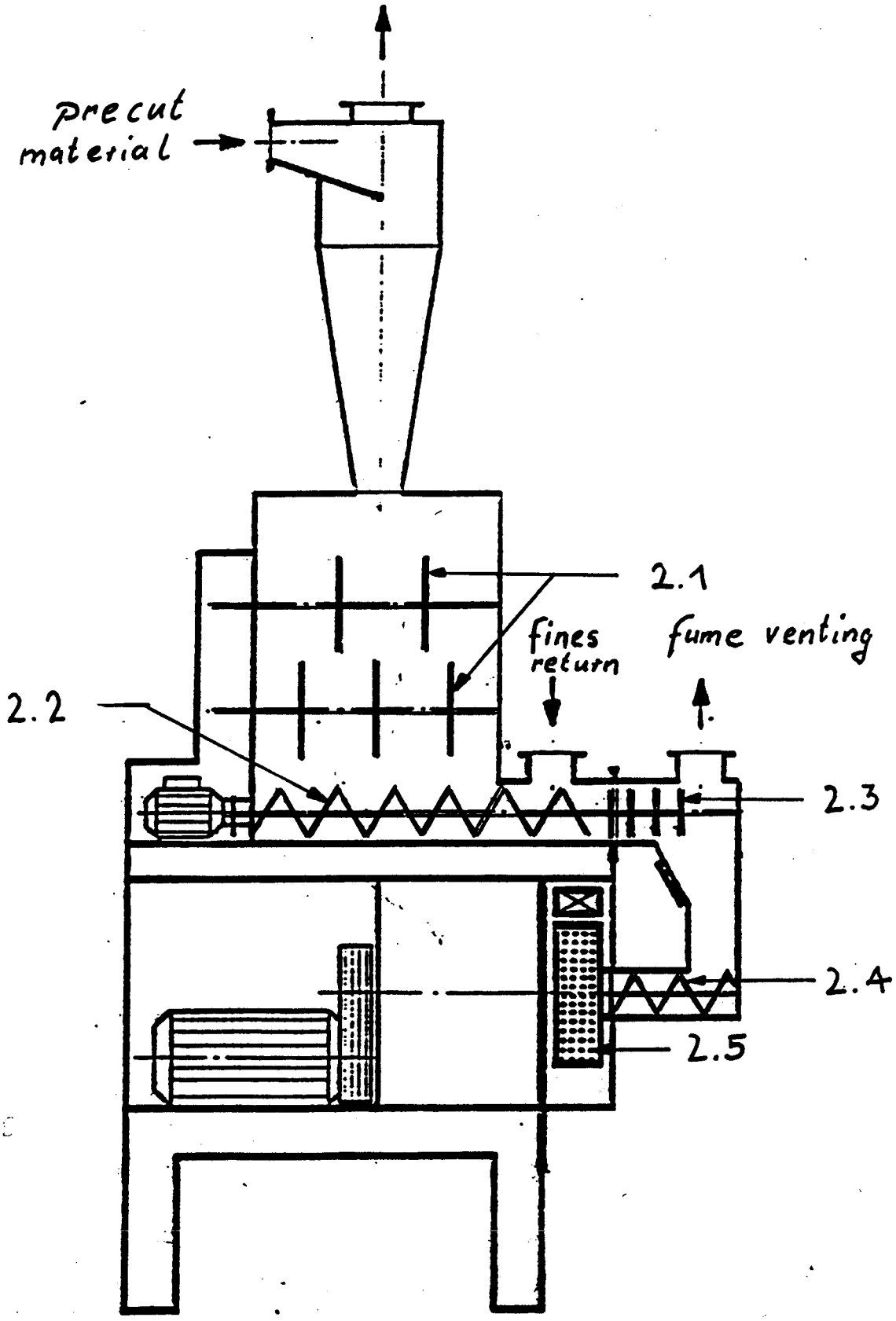
Fully automatic operation.

Not labor intensive (one operator)

Compact space saving building block system

Schnitt durch den PFV
Cross Section through the PFV
Vue en coupe du PFV

Sketch 2



Description of Sketch 2

Pos. 2.1 Horizontal stirrers

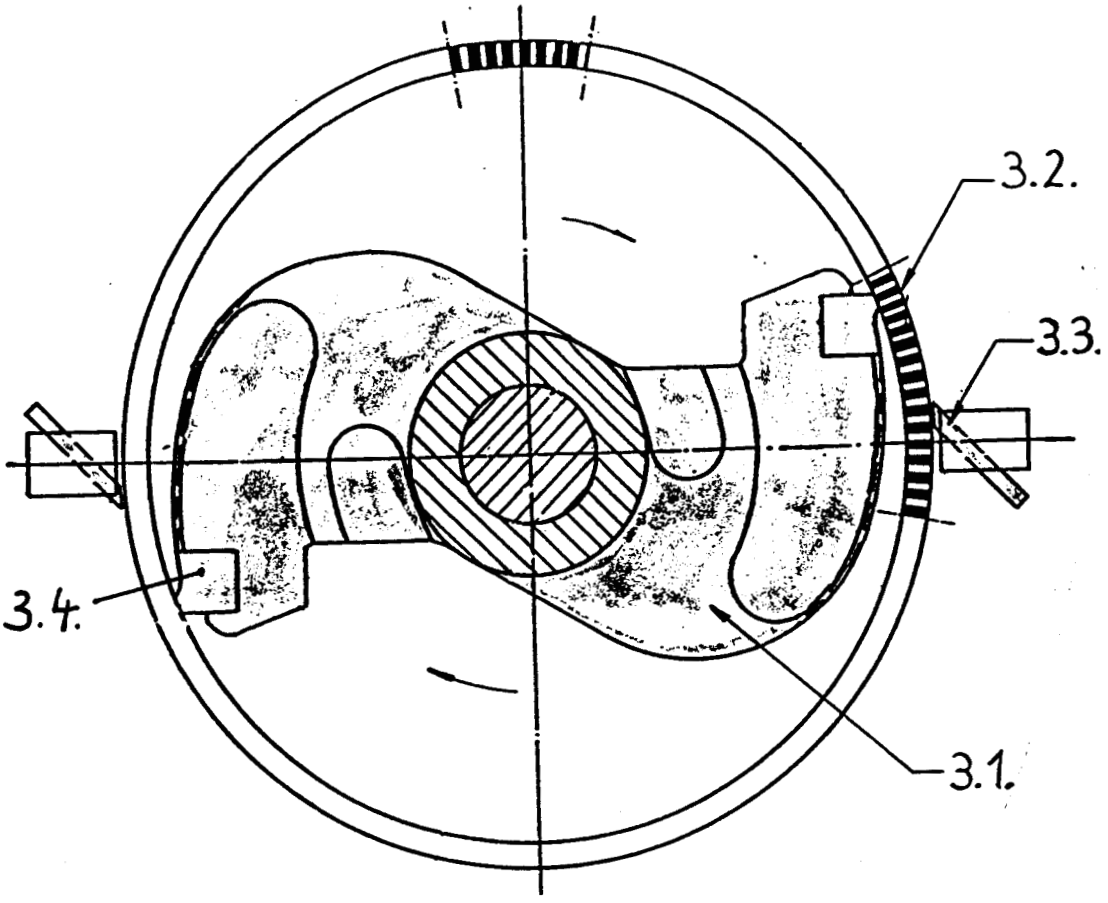
Pos. 2.2 Frequency controlled discharge screw

Pos. 2.3 Paddle screw

Pos. 2.4 Feed screw

Pos. 2.5 Die

The stirrers in the hopper keep the precut material free flowing and mix it (Pos. 2.1). A frequency controlled screw (Pos. 2.2) discharges the material out of the hopper, the paddle screw (Pos. 2.3) loosens the material up. On the downward slope the material slides over a magnet to remove some ferric contamination. The feed screw (Pos. 2.4) pushes the material into the agglomerating chamber inside the die (Pos. 2.5)



Cross Section through the Agglomerating Chamber

Pos. 3.1 Agglomerating wing

Pos. 3.2 Die

Pos. 3.3 Rotating Knives

Pos. 3.4 Pressure Cams

The agglomerating wing rotates clockwise. The material is pressed like a wedge between agglomerating wing (Pos. 3.1) and die (Pos. 3.2). Due to the movement of the material over the inside surface of the die frictional heat is created which plasticizes the material. The pressure cams (Pos. 3.4) push the material through the holes of the die. Rotating knives (Pos. 3.3) cut or scrape the material off the outside of the die.

Q U E S T I O N N A I R E

PLAST - AGGLOMERATOR - INSTALLATION

Company _____ Tel.:(___)_____

Address:_____ Name:_____

City, State, Zip _____ Title:_____

_____ Fax #:(___)_____

_____

1. Material to be processed:

___Polyethylene, HD-MD-LD ___Polyester ___ABS

___Polypropylene ___Polystyrene _____

___Nylon, 6 - 6/6 (PA) ___PVC _____

2. Shape of material:

___film, _____" thick ___filaments, _____" thick

___foam ___threads, _____" thick

___powder, ___mesh ___others: _____

3. Condition of material:

___dry ___wet, _____% moisture ___oily, _____% oil content

___others: _____

4. Additives contained:

___no ___yes: _____

5. Heat sensitivity:

Softening temperature: _____ ° _____ Melting point: _____ ° _____

6. Product size desired: _____"

7. Thruput rate desired: _____ lbs./hr.

8. Bulk density desired: _____ lbs./cu. ft.

9. Special requirements: _____ none ___adding pigment

___others: _____

10. Can you provide material for a larger test?

___yes: _____ lbs. _____no: _____

11. Would you like to witness the tests? ___ yes ___ no

12. What is the intended use for the product?

_____

13. Remarks: _____

_____

Date: _____ Signature: _____

Revised: 4/89

PALLMANN PULVERIZERS CO. INC. 820 Bloomfield Ave. Clifton, N.J.07012 Tel.(201) 471-1450 Fax (201) 471-7152