

A SIMPLE CLEANING MACHINE FOR MATTRESS FIBRE

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ABSTRACT

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A Simple low cost cleaning machine for mattress fibre was designed and manufactured by the Coconut Processing Board in order to get rid of dust in dry mattress fibre. This machine is described with tables to indicate how the particular design came to be considered the most suitable for the purpose. The conditions under which it should be operated to give the best results are indicated.

INTRODUCTION

Mattress fibre exported from Sri Lanka has a high percentage of dust and pith. Considering the high cost of freight and the cost of labour in developed countries, this is wasteful both from the exporters' and importers' point of view.

Fibre is now cleaned only in the wet state, and is not cleaned after drying. A considerable quantity of dust accumulates during drying. The Coconut Processing Board, therefore, took up this problem and decided to try out a design for a simple low cost sifter for getting rid of the dust from mattress fibre. Various types of sifters which were available at mills were studied and a simple sifter within the reach of every mill in regard to cost was designed and fabricated. Adjustments were made after experimentation; a summary of the results is given in Table 1. The recommended model is shown in Figures 1 (a), (b) and (c).

DESCRIPTION OF THE SIFTER

The sifter consists of a central axle [fig. 1 (c)], 3.35 metres (11 feet) long to which are attached beaters (E) arranged spirally. Each beater is flat about 25.40 cm (10 in) long and 6.35 cm (2.5 in) broad. This shaft and beater arrangement is enclosed in a rectangular wooden box with a hinged door (H) to facilitate clearing out the dust which is eliminated during cleaning. The lid is semi-circular (A) and made of wood. It is hinged on to the rectangular box on the opposite side to the door (H). The hinged lid permits easy access to and cleaning of fibre in the machine. The shaft is driven by a 3 h.p. motor which works on a pulley (D). Fibre is fed through the hopper (F) and the cleaned fibre exits through the other end (G) of the machine. A semi-circular perforated metal plate forms the base of the sifter (B). The perforations are 1.27 cm (0.5 in) in diameter. The dust falls through the perforations on (B) and can be collected and weighed.

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Table 1. *Effect of R.P.M., moisture, weight of fibre and beater design on performance of machine*

	<i>Wet or Dry</i>	<i>Quantity</i>	<i>R.P.M.</i>	<i>Beater Type</i>	<i>Pore Size</i>	<i>Time</i>	<i>Output of Fibre</i>	<i>Output of Dust</i>	<i>Comments</i>
	Control	.. —	—	—	—	—	—	—	—
Wet Stage	1. Wet Mattress	.. 9.07 kg (20 lb)	350	Screw type arrangement Round Beater	2.54 cm (1 in.)	1.5 m	Nil	Nil	Unworkable as fibre became entangled in beaters.
	2. Wet Mattress	.. 9.07 kg (20 lb)	250	„	2.54 cm (1 in.)	1.5 m	Nil	Nil	— do —
Dry Stage	3. Dry Omat (Control)	.. 5.44 kg (12 lb)	250	Flat	1.27 cm (½ in.)	1.5 m	5.44 kg (12 lb)	Nil	Omat unlike mattress fibre is free of dust. Therefore omat cleaning, serves as a control experiment for mattress fibre. Observation reveals that no baby fibres are coming through thereby indicating that there is no breakage of fibre by beaters.
	4. Dry Mattress	.. 5.44 kg (12 lb)	350	Round	2.54 cm (1 in.)	1.5 m	4.3 kg (9½ lb) 79.1%	1.13 kg (2½ lb) 20.9%	Some heat generated. High proportion of baby fibre with dust. Possibility of fibre igniting if heat is intense.
	5. Dry Mattress	.. 5.44 kg (12 lb)	250	Flat	2.54 cm (1 in.)	1.5 m	4.3 kg (9½ lb) 79.1%	1.13 kg (2½ lb) 20.9%	Better cleaning without lumps of fibre.
	6. Dry Mattress	.. 5.44 kg (12 lb)	250	„	1.27 cm (½ in.)	1.5 m	4.53 kg (10 lb) 83%	0.9 kg (2 lb) 17%	With the decrease in pore dimension less baby fibres are sifted out.
	7. Dry Mattress	.. 6.8 kg (15 lb)	250	„	„	—do—	Nil	Nil	As the quantity of fibre fed into the machine is increased clogging of fibre within machine lowers the efficiency to such an extent that the machine is not workable
	8. Dry Mattress	.. 9.07 kg (6 lb)	250	„	1.27 cm (½ in.)	1.5 m	Nil	Nil	— do —

Fig. 1 (a)

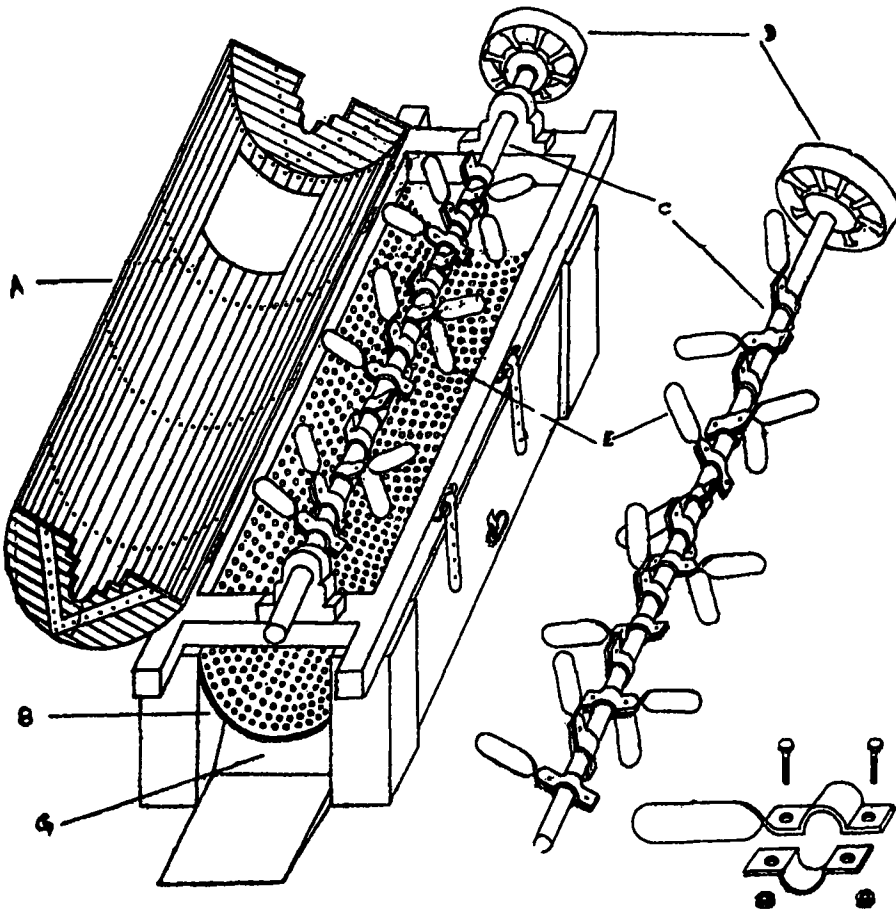
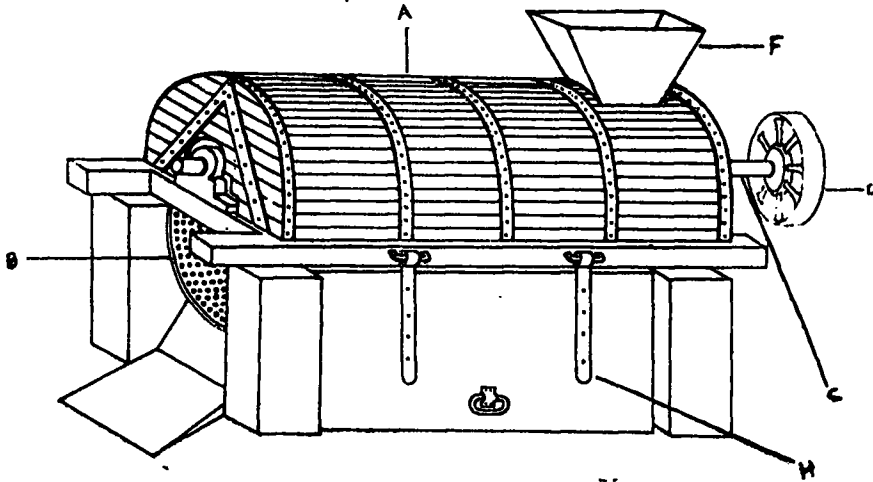


Fig. 1 (b)

Fig. 1 (c)

Fig. 1 (a) Simple cleaning machine for dry mattress fibre.
 (b) Shaft beaters and the wooden box of the machine.
 (c) Details of the shaft and the beater.

A. Lid. B. Bass of the sifter. C. Central Axle.
 D. Pulley. E. Beaters. F. Hopper. G. Outlet. H. Door.

METHOD

The mattress fibre was manufactured under normal factory conditions by soaking in pits, decorticating by Sri Lanka type drums and sifting when wet in a rotary sifter. A paddle sifter was not used. The fibre was sun dried and then sent through the cleaning machine.

Approximately ten samples were tested for each experiment as given in Table I and the most suitable was thereafter used during commercial production.

RESULTS

After some trials it was found that the best conditions are as given in (5) of Table 1, i.e., screw type arrangement of flat beaters on a shaft turning at 250 R.P.M. Approximately 5.44 kg (12 lb) of fibre only should be in the machine at any given time for thorough cleaning. If more fibre is fed in then the cleaning is less complete. The reduction of the pore size from 2.54 cm (1 in.) to 1.27 cm (0.5 in.) ensures that the baby fibres will not be lost during cleaning.

DISCUSSION

There has been the agitation from buyers abroad that mattress fibre should be cleaner. There are difficulties in developed countries in finding labour to work with 'dirty materials' and there is also the problem of disposing of the dust.

- (a) Pith which adheres to the fibre. This is present even in what is called F. A. Q. fibre (Fair Average Quality) and consists of bits of husks that have not come off in the decorticating process. This pith is a source of annoyance to the buyers.
- (b) Dust which is powdered fibre and husk formed during the manufacturing process and not properly sifted out from the mattress fibre. To get rid of (a) careful decorticating and sifting with a beater sifter (also known as a paddle sifter) at the wet stage is necessary. The beater sifter is very necessary for the production of clean fibre, but the high cost of fabrication and the extra cost of labour for operation prevents many millers from investing in one. In fact out of about 700 mills, only 60 have beater sifters.

Regarding (b) dust is present even if a beater sifter is used, but to a lesser extent. Fibre sifted by the simple rotary sifter used in the majority of mills has a higher dust content. Most of this dust can be got rid of from dry fibre by using a simple sifter as described above. This sifter serves the purpose of getting rid of dust from dry fibre.

Therefore a combination of a beater sifter and dry fibre sifter would do much to produce a cleaner fibre. However, there must be an incentive by way of a better price if millers are to invest in it.

The Sri Lanka Bureau of Standards has formulated standards for mattress fibre (among other fibres). If these specifications are strictly implemented, sifting of dry fibre will be necessary for all mills. The sifter described here is of simple construction and can be fabricated in the milling areas by local mechanics and will only cost about Rs. 3,000/-, a cost that any mill could afford.

There is no doubt that improvements could be made to this design. We hope that suggestions will come up as the machine is used. Any suggestions for modifications and improvements to this machine that readers could suggest are welcome.

ACKNOWLEDGEMENT

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