THE FEASIBILITY OF BUILDING A FACTORY PRODUCING RAFFIA BAGS IN LEBANON

by

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES.

LIST OF TABLES (continued).

CHAPTER I.

INTRODUCTION.

A- Purpose of the project :

The purpose of this project is to assess the economic feasibility of a factory of a given capacity, which is to produce woven plastic bags of different colours and sizes. This study will concentrate on sensitivity analysis of profitability under different assumptions concerning the future state of the economy, market share, state of competition and structure of prices.

The methods in the study include the profitability indicators for the project which are cash flow statement, net present value, internal rate of return, and payback period.

B- Emergence of the idea :

There are several reasons that lead to this research :

1- There seems to be a high demand for these specific kinds of plastic bags, known as Raffia bags. Some of their uses include all sort of grains, fertilisers, chemicals, sugar, salt, flour, all sort of food powder spices, detergents, etc.. .

2- There are only four factories which produce these plastic bags in Lebanon and their total output is much lower than local demand.

3- Lebanon imports more than fifty percent of total consumed plastic bags from Taiwan to bridge the gap of demand.[1]

4- Prices sold by the Lebanese companies compete with those imported from Taiwan.

5- The quality of the plastic bags either produced locally or imported is of the same standard.

1- Chamber of Industry and Trade.

C- Factory location :

The factory is to be established in one of possible industrial zones namely :

1 -Naameh industrial zone.

2 - Sidon industrial zone.

3 - Choueifat industrial zone.

4 - Moukalis industrial zone.

5 - Zouk industrial zone.

6 - Matin industrial zone.

7 - Sin El-fil industrial zone.

8 - Zahle industrial zone.

9- Tripoli industrial zone.

The actual location will be studied at a later stage of this research taking into account the following variables :

1- Price of land in each industrial zone.

2- Availability of labour near the industrial zones.

3- Transport facilities to and from the industrial zone.

4- Proximity of industrial zones to major market outlets.

5- Security conditions in the industrial zones.

D- Factory layout plan :

Based on capital constraint and opinion of experts who studied the economies of scale in this industry, the optimum size of the land, on which the factory is to be built, should be equal to 2,000 square meter.

The building of the factory is to be two stories high. The ground floor constitutes the actual factory. Floor number two is divided into 2 sections :

a- The Warehouse Section.

b- The Management Section.

1- Ground floor.

The ground floor is the actual factory. There are two stages of operations.

- Stage I : the raw material (polypropylene granules) is transformed into plastic threads.
- Stage II : these threads are woven and cut to produce the final plastic bags, known as Raffia.

a- Stage I.

a1- Machines of Stage I :

- Mixer.
- Silo.
- Extruding machine. (see Appendix page A15).
- Four drum machines, one of which consists of three cylinders and the other three consist of five cylinders. (see Appendix page A14).
- Two cutter machines differing in the size of the cutting.
- Two ovens.
- Spindle winder. (see Appendix page A8,A14).

For a closer look at the whole stage of operation processing of Stage I, look at the schematic drawing Part I in the Appendix page A11.

a2- Process of Stage I :

The raw material, "polypropylene" in form of granules is poured into the mixer with colouring powder. The ratio of granules to colouring is fifty to one by weight. The mixture is transferred to the silo, which is the tank that holds the mixed granules and powder. The silo feeds the extruding machine.

In the extruding machine, the granules are melted to form a plastic sheet which passes to the drum consisting of three cylinders which straightens the sheet. The sheet passes through the first cutter which cuts the sheet into several smaller sheets which are then passed onto the oven through the second drum. The sheets are heated and not melted. The hot sheets pass through the third drum and are stretched. Once again the sheets are passed onto the second oven for re-heating and are stretched once more by the fourth drum machine. The sheets are then cut into fine threads by the second cutter and are rolled on plastic rollers by the spindle winder machine thus producing the semi-finished product.

The filled rolls are then stored in the warehouse and the spindle winder machine is furnished with an empty set of rollers and so on... .

b- Stage II.

b1- Machines of Stage II :

- Circular Weaving loom machines. (see Appendix pages A1,A2,A4,A9,A10 and A12).
- Unrolling device. (see Appendix page A5).
- Inspecting and thermocutting machine. (see Appendix, page A6).
- Semiautomatic sewing machine. (see Appendix, page A7).
- Bailing press to compress finished bags.

For a closer look at the whole stage of operation processing of Stage II, look at the schematic drawings part II-1 and part II-2 in appendix page A12 and A13.

b2- Process of Stage II.

The filled rolls of stage I are installed onto the circular weaving loom machines. These machines weave the fine threads to form plastic circular tissues which are rolled on big rollers. These rollers are placed on the unrolling device to pass on to the inspecting and thermocutting machine which cuts the tissue to pre-set specific length by applying heat. The cut tissue is inspected by the machine for any defects. In case of defects, the tissue is ejected from the cycle.

The inspected tissues are sewn by the semiautomatic sewing machine to form the Raffia bags, i.e. the final product. The Raffia bags are joined in batches and compressed by the bailing press to reduce their occupancy of space so as to be able to increase the capacity of the warehouse.

2- Floor Number Two.

Floor number two is divided into 2 sections :

a- The Warehouse Section.

b- The Management Section.

a- The Warehouse Section :

The warehouse is to contain the following items :

- The raw material needed for the production process.
- The semi-finished product produced at stage I.
- The final products. i.e. Raffia bags.
- Two generators, each of a power of two hundred and fifty kilo-volt amperes (250 KVA.).
  The second generator is for standby in case of failure of the first generator.
- Spare plastic and metal rolls to be used as the supporting core for the threads and the material produced.

b- The Management Section.

The Management section is divided into two departments.

- Production department offices :
  - Production manager office
    "Industrial engineer" office.
  - Production assistant office.
  - Secretary's office.
- Sales department offices :
  - Sales manager office.
  - Sales assistant office.
  - Secretary's office.

The two floors should be equipped with automatic fire extinguishers to help prevent fire hazards.

CHAPTER II.

INDUSTRY IN LEBANON.

A- Industry before year 1975.

The history of development of Lebanese industry since the late sixties is one of fast growth followed by a period of relative stagnation and decline.[2]

In the late sixties and early seventies, industrial activity expanded and evolved rapidly encouraged by a set of favourable factors, namely, political stability in a relatively troubled region, a large supply of low cost industrial labour, subsidised fuel and electric power, easy credit terms, a strong and stable Lebanese pound versus foreign currencies which helped reduce the cost of raw materials and industrial machinery and equipment, growing export markets, especially in the Gulf countries, and effective trade protection for a number of industries.

As a result, the contribution of the industrial sector to Lebanon's gross domestic product increased from 13 percent in 1968 to an estimated 20 percent in 1974-75.[3]

2- Marwan Iskandar and Elias Baroudi, "Industry", The Lebanese economy in 1982-83, (Beirut : Shoushan advertising, 1984), pp : 31.

3- Ibid. pp : 31.

Industrial exports increased by 90 percent between 1973 and 1974 to reach under 846 million Lebanese pounds and the industrial sector in 1974 provided 16 percent of national income.[4]

B- During the war.

A study carried out by the Industrial Development Centre for Arab States during 1977 estimated that 15 percent of total capital invested in industry had been lost and that war damage represented another 35 to 40 percent.[5] An estimated 150 industrial establishments with a total paid-up capital of 1 billion Lebanese pounds were destroyed, another 321 establishments were damaged, and close to 20 percent of fixed capital in industry was lost.[6] Industry was somewhat slow to pick up after the war had settled from year 1978 to 1980.

4- Europa Publications, Middle East and North Africa 1988, (London: Europa Publications Limited, 1987, 34th edition), pp : 561

5- Ibid. pp : 561

6 - Marwan Iskandar and Elias Baroudi, "Industry", The Lebanese economy in 1982-83, (Beirut : Shoushan advertising, 1984), pp : 32.

In 1981, Lebanon faced another setback with the fighting around the town of Zahle which later spread to Beirut. Thus production dropped significantly as some firms had to close down and others worked at less than 60 percent of capacity.

The Israeli invasion in 1982 caused further heavy losses. Israeli forces were said to have destroyed 25 of the country's major industrial units and to have damaged many smaller enterprises. The Chouf war of autumn 1983 caused 140 factories to close down.

The Israeli occupation of southern Lebanon also posed serious problems for industrialists, who had to compete with a large influx of Israeli goods entering the country. This not only meant that local goods were competing with cheaper Israeli items, but also led to the problem between Lebanon and its Arab neighbours, who suspected that Israeli goods were being exported to them through Lebanon and imposed an embargo on some Lebanese products.

In 1985, however, largerly as a result of the collapse in the value of local currency, industrial exports rose by 23 percent compared with 1984. In 1986 industrial exports increased to $477 million.

In 1987 industrial exports reached $600 million, that is an increase of 25 percent over the previous year.[7]

In 1988 industrial exports reached for the first 9 months amounted to $290 million according to the Chamber of Commerce. It should be taken into consideration that this amount represents only about 40 percent of the actual declared value of the exports[8] because merchants were importing goods from unofficial harbours such as Dbayeh harbour, Ouzai harbour, Khalde harbour, etc. ... . Thus the actual value for exports of year 1988 is equal to 290 million divided by 9 months and then multiplied by 12 months to obtain the figure for the whole year. The result is multiplied by 100 and divided by 40 thus getting the actual value of the exports to be $966 million. Comparing the exports of year 1988 with that of the previous year, we find that exports increased by about 50 percent. This increase in exports is due to the decrease of the value of the Lebanese pound compared to foreign currencies and due to the low

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7- Kahwagi, Elie, AN NAHAR newspaper, (Beirut, Jan. 18, 1988) pp : 4 - 5.

8- ALMAL WAL ALAM magazine, (Beirut, Jan. 1988) pp : 10.

salaries paid to the employees.[9] Lebanese products have penetrated new markets which were not accessible before due to high competition. Lebanese products are capable of competing with foreign similar products by price and by quality standard.

9- ALMAL WAL ALAM magazine, (Beirut, Jan. 1988) pp : 10.

C- The Lebanese Industry.

Table I (page 17) shows a rough profile of Lebanese industry until year 1981.

A look at Table I shows :

- The largest number of establishments in the same industry is in the clothing industry which contains 78 firms. Following is the metal product industries with 77 firms, then the furniture industries with 76 firms , and then food product and beverages industries with 59 firms.

- The average paid up capital per establishment was highest in the textiles and tapestry industry which amounted to 1,833,000 Lebanese pounds, followed by the Printing and Binding industry which amounted to 1,017,000 Lebanese pounds.

- The average number of workers employed per establishment is highest in the textiles and tapestry industry with an average of 45 workers, followed by the clothing industry with an average of 30 workers.

The Lebanese industry as shown in table I, is mostly of small scale industries with only a few industries which can be described as medium or heavy industries namely those producing cement, steel and aluminium products.

TABLE I.

Profile of Industrial Establishments Registered with the General Directorate of Industry, 1981.

Industry	Number of factory	Total Paid-up Capital (LL)	Average Capital per factory (LL)	Total Number of worker	Average Number of Workers per factory
Food Products and Beverages	59	27,840,000	472,000	1,298	22
Textiles and Tapestry	9	16,500,000	1,833,000	405	45
Clothing	78	20,800,000	266,000	2,340	30
Shoes and Leathers	18	4,170,000	232,000	324	18
Wood products	30	2,570,000	86,000	360	12
Furniture	76	16,700,000	220,000	1,064	14
Paper and Cardboard	6	1,650,000	275,000	84	14
Printing and Binding	14	14,240,000	1,017,000	350	25
Chemicals	11	5,880,000	534,000	110	10
Glass and Pottery	10	1,240,000	124,000	80	8
Pre_cast Concrete and Concrete Block	22	10,740,000	488,000	440	20
Metal products	77	17,100,000	222,000	924	12
Electric product	24	15,940,000	664,000	696	29
Plastic product	17	8,490,000	500,000	204	12
Jewellery	21	3,920,000	186,000	210	10
Foundries	3	600,000	200,000	36	12
Other	47	18,590,000	395,000	564	12
TOTAL	522	186,970,000	--	9,489	--

Source: Ministry of Industry and Oil, General Directorate of Industry

Table II (pages 19,20) shows new industrial enterprises which started operations in 1978, 1979 and 1980 and 1982.

In table II, we note that a number of new establishments have started operations. Thus increasing capital and work force.

TABLE II.

New Industrial Establishments

Set Up During 1978, 1979, 1980 and 1982

by Type of Industry

Industry	Number of Industries	Paid-Up Capital (LL)	Number of Workers
Year 1978			
Mineral Water	2	17,000,000	65
Food Products	3	6,100,000	145
Clothing	1	1,500,000	40
Carpets	1	5,000,000	100
Brushes	1	1,000,000	15
Plastic Products	1	50,000	3
Cosmetics & Pharmaceuticals	2	750,000	15
Prefabricated Houses	1	3,000,000	80
Sanitary Ware	1	500,000	10
Electrical Equipment	1	2,000,000	12
Industrial Products	2	2,200,000	35
Printing	1	400,000	12
TOTAL	17	39,500,000	532
Year 1979			
Food Products	5	16,550,000	110
Plastics	2	3,700,000	26
Textiles	1	22,000,000	150
Gas Bottling	1	400,000	15
Industrial Products	1	400,000	6
TOTAL	10	43,050,000	307

TABLE II (continued).

Industry	Number of Industries	Paid-Up Capital (LL)	Number of Workers
Year 1980			
Food Products	3	2,800,000	29
Cardboard & Plastic Products	2	3,900,000	47
Prefabricated Houses & Warehouses	1	2,000,000	10
Construction Materials	5	3,709,000	108
Screws & Nails	2	1,600,000	38
Other	3	1,760,000	31
TOTAL	16	15,769,000	263
Year 1982			
Food Products	6	20,433,000	71
Sorting, Packaging & Canning	1	44,000,000	100
Clothing	2	500,000	40
Compressed Wood	1	3,000,000	10
Plastic & Chemical Products	1	1,000,000	35
Mineral Oils	1	6,350,000	10
Construction Product & Materials	2	6,500,000	25
Prefabricated Steel Bridges	1	3,600,000	10
Truck Trailer & Tanker Chassis	1	1,495,000	25
Cosmetics	2	13,500,000	52
Telephone Equipment	1	1,700,000	25
Gas Bottling	4	6,300,000	44
Other	2	1,900,000	20
TOTAL	25	110,278,000	467

Source: Ministry of Industry and Oil, General Directorate of Industry

D- Industry Incentives applying to Raffia production.

Please note that the industry incentives listed below do not apply when the country is in a state of war and chaos. Nevertheless, I think it is worth mentioning in order to inform the reader of the benefits the industry would gain in normal situation.

1- Exemption of raw material imported for local industries from custom duties.[10]

2- Exempting imported machinery for industry from custom duties.[11]

3- Free zone regulations allow factories located in that zone, a total exemption from custom duties on materials imported to be manufactured for re-export.[12]

4- Normal custom duties on imported goods is 18 percent which constitutes in most cases, an efficient protection for local manufacturers against foreign competition.[13]

10- S.B. Gibryl, "Industrial Prospects in Lebanon Year 1977", (Beirut) pp : 25.

11- Ibid. pp : 25.

12- Ibid. pp : 25.

13- Ibid. pp : 25.

5- Special low rate tariff for electric power consumed in industry.[14]

6- Special low taxes are imposed on transport vehicles working for, and owned by, industrial establishments.[15]

7- Low custom duties (reduction of 25 percent up to full exemption) on most Lebanese manufactured or produced goods, are charged by Arab importing countries - in conformity with economic bilateral agreements.[16]

8- New Lebanese industrial establishments are tax exempt for a period of eight years.[17]

9- Loans for industrial establishments are provided. The term of the loan is ten years whereby the first payment is to be due after five years.[18]

14- S.B. Gibryl, "Industrial Prospects in Lebanon Year 1977", (Beirut) pp : 25.

15- Ibid. pp : 25.

16- Ibid. pp : 25.

17- Ibid. pp : 26.

18- INDICATOR, Economic and Business Weekly Magazine, (Beirut, June 21, 1986, 3rd year. Issue # 137) pp: 35.

E- Expectations of the Future.

1- Scenario One : Complete Stability.

If the situation is going to improve, an industrial boom will evidently seize the country.

The reasons for the forecasted boom is :

- Location of Lebanon : Advantageous geographic situation of Lebanon and its important commercial role as a distribution centre to all countries of the Middle East (of course except Israel) due to its strong relations with these countries.

- Internal and International transport facilities by sea, land and air.

- Low wages will provide a stimulus for foreign and local investors to set-up factories in Lebanon.

- The role of the laissez-faire economy encourages people to invest.

- Government incentives towards the industry. For example, setting up free zone areas, tax exemptions, etc...

2- Scenario Two : No change in the Current Situation.

The instability in the political situation of the country will depreciate the local currency as it has for the past several years.

The depreciation of the Lebanese pound has a benefit to the industry sector. Lower value of the money means lower labour costs.

Thus Lower value of the Lebanese currency will attract risk taker investors to invest in Lebanon.

It has been noted that the textiles industry has more than quadrupled these last two years due namely to the depreciation of the local currency.

Lebanon is exporting textiles to most countries of the world. Lebanon is able to compete with other exporting countries by price and quality. The benefit of a depreciation in the currency leads to additional exports which will have an expansionary effect on domestic production and employment.

CHAPTER III.

ESTIMATION OF REVENUES.

The sources of information are divided into primary and secondary data.

A- Primary Data :

Primary data contains publications, documents, volumes and articles. The importance of primary data lie in the fact that they contain more complete and accurate data. Publications provided information of the industrial situation in Lebanon before the war and until year 1988.

The importance of the role of the industry is of a great value to my study since growth and decline of the industry is reflected by the political situation of the country. The problems that faced the industrial sectors during the war serve as precautionary guidelines for any future project to be studied.

B- Secondary Data.

Secondary data includes surveys, interviews with Mr. Samir Kilani, owner of Convertex factory and with Mr. Ahmad Chebarek, owner of "Sharikat Al-Masharii Al Koubra" factory, who provided me with ample information concerning the Raffia production process and information concerning demand.

Other interviews were made with Mr. Wadii Najjar, an importer of Raffia bags, who provided me with the cost of importing these bags as well as information on the competition between local and foreign production.

The plant design and layout was provided by AGACHE - WILLOT company which manufactures machines that produce Raffia bags because of their interest to sell their machines.

Other interviews were made with Miss Rita Ayoub and Miss Malek, who are responsible in the research department of the Chamber of Industry and Trade, who provided me with information concerning the imports of Raffia bags and government facilities and incentives to the industrial sector in Lebanon.

Different operational costs, selling price and other relevant information were provided by interviewing the above mentioned factories.

C- Potential buyers of Raffia bags.

Buyers of Raffia bags are great in number because of the wide variety of uses of these bags. Some of the uses of Raffia are :

1- Fertiliser producing firms.
2- Salt producing firms.
3- Sugar producing firms.
4- Animal food producing firms.
5- Detergent and cleaning products producing firms.
6- Flour mills.
7- Merchants of the different types of grains.
8- Merchants of the different types of spices.

We can deduce that Raffia is high in demand. Raffia's buyers are concerned with price and delivery time. These two factors alone determine who the supplier will be, because quality is considered homogeneous.

D- Local firms producing Raffia bags.

Study of the local industry revealed that there are only four companies which produce Raffia bags.

These companies are :

TABLE III.

Local Factories of Raffia.

Name.	Area	Production - Level -
- 1 Company of Big Projects. "Sharikat Al-Masharii Al Koubra".	Naameh	Full.
- 2 Kassem factory.	Zalka	Full.
- 3 Al-Kallas factory.	Sin El-fil	3/4.
- 4 Convertex factory.	Naameh	Full.

Three of these companies are operating at full capacity[19]. After averaging the price of Raffia bags being sold at these factories, the price was obtained to be approximately three dollars per kilogram of bags. The total output at full production of these factories is approximately 1,700 tons per year.

19- Interview with Mr. Samir Kilani and Mr. Ahmad Chebarek.

E- Importers of Raffia bags.

Importers of Raffia constitutes more than 50 percent of total bags sold in Lebanon. Lebanon imports around 1,900 tons of Raffia bags yearly.[20]

The cost price of importing Raffia ranges between $0.255 and $ 0.27 each 90 grams (equivalent to the standard weight of one bag which is of standard size).[21] Thus cost of Raffia in kilograms ranges between $ 2.80 and $ 2.90 per kilo. This cost includes transportation to Beirut and handling charges.

The selling price of importers ranges between $ 3 and $ 3.5 per kilo. The reason for the price fluctuation is tied with local production. If local production is short of handling customer demand, the importer is the only source to provide Raffia. Thus price sold by the importers increases.

20- Chamber of Industry and Trade.

21- Interview with Mr. Wadii Najjar importer of Raffia bags.

F- Increase in population.

Increase in the level of population leads to an increase in the level of consumption. More of everything is required. More merchants will enter the market to satisfy the people's requirements. Thus Raffia's demand will continue to increase.

We can conclude that the demand for Raffia bags is approximately proportional to the increase in population.

G- Two possible scenarios affecting demand.

1- Scenario One, Complete Stability :

The Lebanese government has taken measure to help the Lebanese industry compete with the foreign industry. When the authority of the state will be reinstated, the government will be able to collect the taxes on imported products so as to protect the Lebanese industry. Thus the market share of the importers of Raffia will decrease. This decrease will reflect an increase in the market share of the local firms.

2- Scenario Two, No change in the current situation :

Although more than 50 percent of Raffia bags are imported, the depreciation of the Lebanese currency means lower wage rates, lower utilities expense, thus lowering in the cost of production. Lebanese firms can confidently compete with the imported products. Thus demand for local produced Raffia bags will be high.

H- Estimation of Demand.

The importers of Raffia are purchasing the bags at $ 2.80 and $ 3.0 per kg., including cost and freight to Beirut. If they add a simple profit of 10 %, the selling price will be between $ 3.08 and $ 3.3 per kg. Thus, importers of Raffia bags cannot compete with local production. Importers bridge the lack of supply of Raffia bags to the market due to insufficient number of local factories to meet demand.

The factory to be established is to extract its market share from the importers side. The factory's market share is approximately 18 percent of the importers share (see table III-I p: 33). The market share figure is derived by dividing maximum yearly capacity of 349,000 kgs by the importers 1,900 tons yearly.

The quality of both, the imported and the locally produced Raffia bags, is homogeneous.

According to the opinion of experts in this field, the economies of scale is insignificant.

The factory should be able to sell at full capacity at the prevailing market price because of its low market share. The factory's market share is 10 percent of the total market share (see table III-I p: 33).

TABLE III-I.

Raffia's yearly consumption

Local Raffia production	:	1,700 tons / year
Imported Raffia	:	1,900 tons / year
Total	:	3,600 tons / year

- Yearly production of factory : 349 tons / year
- Market share of factory to total consumption = 10 %.
- Market share of factory to importes = 18 %.

I- Revenues.

To compute the expected revenues, we need to calculate the maximum capacity of production for the whole year.

Full capacity per day equals to 1,230 kgs. (see p: 38 - 39).

Days in working week = 6 days/week.

Number of working weeks per year = 50 weeks.

The machines are noted to work at 95 percent efficiency, whereby the 5 percent inefficiency is due to the malfunction of the machines.

Maximum yearly capacity = (1230 * 6 * 50) * 95% =

350,000 kgs per year.

Prevailing market price = $ 3 / kg.

Yearly Sales = $ 1,050,000.

Direct variable costs affecting the sales equal to :

TABLE IV.

Yearly direct expenses for 350,000 kgs/yr.

- Labour costs	$ 30,000.
- Raw material usage	$ 588,000.
- Salaries expense	$ 23,400.
- Office supplies	$ 3,600.
- Fuel cost	$ 28,500.
- Utilities expense	$ 500.
Total yearly direct expense	$ 674,000.

Depreciation costs affecting the sales equal to :

TABLE IV-I.

Yearly depreciation costs.

Name	Cost	Life span	Dep/yr.
Building	$300,000	50 yrs.	$6,000.
Machinery	$730,000	10 yrs.	$73,000.
Generators	$50,000	10 yrs.	$5,000.
Plastic rolls	$5,000	10 yrs.	$500.
Office furniture	$5,000	10 yrs.	$500.
Office equipment	$3,000	10 yrs.	$300.
Fire extinguisher	$4,000	10 yrs.	$400.
Total depreciation costs per year			$ 86,000.

Total costs therefore equal to $ 760,000 per year.

Yearly Net Revenues therefore equal to $ 290,000.

I am going to assume that revenue and cost increase at the same rate, and in my calculations for the years ahead, I am going to use the real value instead of the nominal value and assume that the real value of revenue and cost remains unchanged.

Real value of net revenues for year 1 to year n of operations at full capacity equals to $ 290,000 per year.

CHAPTER IV.

PRESENTATION OF THE VARIOUS COSTS.

A- Equipment Costs.

The machines are divided into the following :

- Part I is where the raw material is transformed into plastic threads.
- Part II is where the plastic threads are woven, cut, sewn to form the final product.
- Part III consists of the generators and the plastic cores used for the threads.

1- Costs of part I.

TABLE V.

Costs of Part I.

Name		Cost per unit	Total Cost
Mixer		$ 13,000	$ 13,000
Silo		$ 10,000	$ 10,000
Extruding machine		$ 200,000	$ 200,000
Drum machine	(4)	$ 15,000	$ 60,000
Cutters	(2)	$ 16,000	$ 32,000
Ovens	(2)	$ 20,000	$ 40,000
Spindle Winder		$ 45,000	$ 45,000
Total cost of Part I.			$ 400,000

It is important to note that Part I produces 62.5 kilograms of thread per hour. Thus maximum capacity in Part I is equal to 1,500 kgs. per 24 hours. We also should note that the above process operates at a 96 percent efficiency level, thus only 4 percent of total output is regarded as having defects. Thus actual output of production of Part I process is equal to 1,440 kgs per 24 hours. The life expectancy of operations for part I machinery is equal to 10 years.

2- Costs of Part II.

Before proceeding with the various costs of the machines in Part II, let us calculate the number of weaver machines required to handle the 1,440 kgs of threads produced.

We are given the following information by the producer of the weaver machine :

1- The speed of the weaver machine is such as to produce 10 kg per hour.

2- The runtime of the machine in one stretch is 4 hours followed by a two hour approximation to refurnish the machine with a new set of plastic thread and to

inspect the machines for any disconnected threads and to rest the machine.

We can deduce that the maximum hours a weaver can perform in a 24 hour period is 16 hours of non-stop weaving.
Each weaver machine weaves 160 kgs of thread per day. Our total output of thread is equal to 1,440 kgs. So we need 9 weaver machines to keep up with Part I production.

TABLE VI.

Costs of Part II.

Name	Cost / unit	Total Cost
Weaver machine (9)	$ 30,000	$ 270,000
Cutting & inspecting machine	$ 40,000	$ 40,000
Sewing machine	$ 10,000	$ 10,000
Bailing Press	$ 10,000	$ 10,000
Total cost of Part II.		$ 330,000

We also should note that the above process operates at an efficiency level of 85 percent, thus 15 percent of total output is regarded as having defects. Thus actual production of Part II process is equal to 1,230 kgs of Raffia bags per 24 hours.

The life expectancy of operations for part II machinery is equal to 10 years.

3- Costs of Part III.

Part III consists of a- generators and b- plastic cores.

a - Generator Costs.

The use of the electric power is an indispensable tool in our modern society. Due to the rationing of electricity, the generator became a must for all kind of businesses in Lebanon.

The factory should have two generators each of a size of 250 kilo-volt amperes (KVA). The second generator is used as an emergency backup in case of failure of the first generator.

The cost of each generator equals to $ 25,000 thus total cost of generators equals to $ 50,000.

The life expectancy of operations for the generator is equal to 10 years.

b - Plastic Cores.

The plastic cores are used to roll the threads on. There should be always available empty rolls in the warehouse. The cost of these rolls is estimated to be equal to $ 5,000.

4- Equipment costs.

Total cost of equipment is therefore equal to $ 400,000 of Part I plus $ 330,000 of Part II plus $ 50,000 plus $ 5,000 of part III.

Total cost of equipment equal $ 785,000.

5- Payment procedures of machinery of Part I and II.

To be able to estimate the payment procedures of the cost of machinery, I took an example of a contract made between Convertex manufacturing company and the foreign company which produces these machines.

The contract between Convertex and the foreign company included the following terms :

1- A bank guarantee supplied by Convertex to the foreign company so as to safe guard the obligations of Convertex.

2- Upon arrival of the machines, Convertex is to pay 30 percent of the total cost of machinery.

3- The 70 percent left of total cost of machinery is to be paid within a maximum period of 5 years.

4- Each year, a minimum of one fifth of the remaining 70 percent should be paid.

I am going to assume that upon the arrival of the machinery, the company to be established is to pay 40 percent of the total cost of machinery and the remaining 60 percent is to be paid in instalment basis for a period of three years. The payments are to be of equal amounts for each year and are to be paid yearly, thus the amount paid in year one of the instalment basis is equal to one third of 60 percent of the total cost machinery. So on for the remaining two years.

B- Labour costs.

Labours are classified as skilled and unskilled.
Part I of the process requires two unskilled and one skilled per shift.
Part II of the process requires three unskilled and two skilled per shift.

Salary of the skilled should be around $ 150 per month. Thus total monthly salary of the skilled equals $ 450 per shift.

Salary of the unskilled should be around $ 75 per month. Thus total monthly salary of the unskilled equal to $ 375 per shift.

Total Labour monthly costs per shift equal to $ 825. Monthly labour costs on the basis of full scale production equal $ 825 times 3 shifts giving a total of $ 2,500.

C- Raw material costs at full production.

Part I process utilises 1500 kg of raw material daily. A mixture of powder colouring is added to the raw material with a ratio of 50 to 1 by weight. Thus, we need 30 kgs of colouring to mix with polypropylene granules.

Cost of polypropylene per kg = $ 1.30
Cost of colouring powder per kg = $ 3.50

Thus cost of raw materials needed for full scale production equals to $ 2,050 per day.

Monthly cost of raw material at full scale production equals to $ 49,200 on a 6 day week basis. An estimated of thread needed for the sewing machine at full production is 50 kgs per month. Cost of sewing thread equals to $ 400 per month.

Thus overall monthly costs of raw material at full scale production equals to $ 49,600 equivalent to 29,500 kg (1,230 kg/day x 24 days/month) of defect-free Raffia bags per month.

Raw material cost to produce 1 kg of defect-free Raffia bags equals to $ 1.68.

D- Fuel Costs.

Fuel oil is used to run the generators. We are going to assume that the average electricity rationing is fifty percent. Thus in every twenty four hours, the government supplies twelve hours of electricity.

I took a high percentage to be on the safe side so as not to underestimate the costs. Assuming we are to operate at full capacity, that is a twenty four hour production process per day, we would have to run the generators for 12 hours per day.

The fuel consumption of the 250 KVA generator is 55 litres per hour. Hence, total fuel consumed per day in a 24 hour interval equals to 12 hours * 55 Litres/hr., giving a total of 660 litres per day.

Fuel consumption per month at full capacity level of production based on a 6 day working week equals to 6 days * 4 weeks * 660 litres/day giving a total of 15,840 litres per month. The cost of one ton of fuel oil is equal to $ 150. Thus the cost of fuel oil consumed in one month at full capacity equals to $ 2,375.

E- Land Cost.

The area of the land that is to occupy the factory should be around 2,000 square meters.

To narrow down our search for a piece of land, it is suggested by various experts such as plant owners, industrialists, and engineers that the plant should be located in one of the different industrial zones because the government offers a lot of fringe benefits such as tax exemptions, availability of cheap government utilities, etc...

These industrial zones are :

TABLE VII.

Industrial zones.

1 - Naameh industrial zone.

2 - Sidon industrial zone.

3 - Choueifat industrial zone.

4 - Moukalis industrial zone.

5 - Zouk industrial zone.

6 - Matin industrial zone.

7 - Sin El-fil industrial zone.

8 - Zahle industrial zone.

9- Tripoli industrial zone.

Source : Mr. Youssef Afra, a reputable land broker.

To be able to estimate the cost of land on which the factory is to be built, several criteria which seem relevant should be evaluated.

These criteria are :

1- Price of land per square meter in each industrial zone. (see table VIII, page 48).

2- Availability of labour near the industrial zones.

3- Transport facilities to and from the industrial zone.

4- Proximity of industrial zones to major market outlets.

5- Security conditions in the industrial zones.

TABLE VIII.

Land prices of industrial zones.

Name of Industrial zone	Average Price of land per meter^2
- Naameh	$ 30.
- Sidon	$ 90.
- Choueifat	$ 40.
- Moukalis	$ 100.
- Zouk	$ 100.
- Matin	$ 30.
- Sin El-fil	$ 150.
- Zahle	$ 55.
- Tripoli	$ 60.

Source : Mr. Youssef Afra, a reputable land broker.

To be able to choose the best possible location of land on which the factory is to be built, I have constructed a table in which I included the following constraints:

1- Price Rating
2- Labour availability
3- Transportation ease
4- Proximity of the market
5- Security conditions.

I have rated each industrial zone with each of the above constraints. The rating is on a scale of 0 to 3, where 0 denotes poor, 1 denotes moderate, 2 denotes good and finally

3 denotes excellent.

I have assigned equal weights to each of the constraints. Thus the zone with the highest total number will be the most favourable one.

TABLE IX.

Criteria rating.

Industry Zone	Price Rating		Labour Available		Transport Ease		Proximity of market		Security Condition	
Naameh	3		1		2		3		1	10
Sidon	1		3		3		3		2	12
Choueifat	3		1		2		2		1	9
Moukalis	1		3		3		3		3	13
Zouk	1	+	3	+	3	+	3	+	3	13
Matin	3		2		3		3		3	14
Sin El-fil	0		3		3		3		3	12
Zahle	2		3		2		2		2	11
Tripoli	2		3		1		2		1	9

Rating Scale explanation.

0 - Poor. 2 - Good.

1 - Moderate. 3 - Excellent.

Source : Opinion of experts such as Mr. Youssef Afra, Mr. Samir Kilani and Mr. Ahmad Chebarek.

Matin industrial zone is calculated as having 14 points, which is the best overall rating. Thus Matin area will be chosen.

Finally the **price of land** on which the factory is to built equals to 2,000 meters^2 x $ 30 per meter^2 giving a total of **$ 60,000.**

F- Building construction cost.

The area of the building to be built should be equal to 3,000 square meters.[22] Construction and finishing costs of one square meter equals to $ 100.[23] This figure includes cost of materials and labour as well as design and supervision. Thus cost of building the factory equals to $ 300,000. The life expectancy of the building is equal to 50 years.

G- Building cost payments.

The estimated time of completion of the building construction is equal to eighteen months.
Payments are made monthly to the contractor in equal instalments.

Since my cash flow analysis in chapter V is based on a yearly time schedule, it is preferable to record the total cost of the building as having being occurred at year one. No further costs will occur to year two. Thus, year one building costs equals to $ 300,000.

22- Mr. Sakr Fakhry. Civil engineer

23- Ibid.

Administrative costs and expenses.

Administrative costs and expenses are divided into the following :

1- Personnel expenses.

2- Office supplies expense.

1- Personnel Expenses.

Total Salaries expense per month equals to $ 1,900. Table X below gives detailed figures.

TABLE X.

Monthly Personnel expenses.

Personnel Position	Number	Salary	Total Salary
Production manager	1	$ 700	$ 750.
Production assistant	1	$ 250	$ 250.
Sales manager	1	$ 500	$ 500.
Sales assistant	1	$ 250	$ 250.
Secretaries	2	$ 100	$ 200.
Total Salaries expense			$ 1,950.

2- Office and supplies cost and expenses.

a- Office supplies expense.

Office supplies expense include paper, pens, telex, telephone, ribbon for telex and typewriter machines, etc... These expenses amount to approximately $ 300 per month.

b- Office furniture Costs.

These costs include chairs, desks, sofas, etc...
Total estimated office furniture costs equal to $ 5,000.
There are 6 offices. In each office there will be one desk, three chairs. Four out of the six offices will each have a sofa.
The life expectancy of office furniture is equal to 10 years.

Table XI below gives a detailed cost breakdown.

TABLE XI.

Office furniture costs.

Name	Number	Cost	Total cost
Desks	6	$ 300	$ 1,800.
Chairs	18	$ 100	$ 1,800.
Sofas	4	$ 350	$ 1,400.
Total Cost of office furniture			$ 5,000.

c- Office equipment costs.

Office equipment costs include typewriter machines, telex machine, photocopier machine. The life expectancy of office equipment is equal to 10 years.

Table XII shows a detailed cost breakdown.

TABLE XII.

Office equipment costs.

Name	Number	Cost	Total cost
Typewriter	2	$ 300	$ 600.
Telex	1	$ 1,500	$ 1,500.
Photocopier	1	$ 900	$ 900.
Total Cost of office equipment			$ 3,000.

Thus total office costs equal to $ 8,000.

Total office supplies expense per month equals to $ 300.

I- Electricity and water cost.

Electricity and water cost will amount to a maximum of LL 20,000 [24] per month. If we are to convert this figure to a dollar amount on the basis that $ 1 equals to LL 500. Thus monthly costs of utilities equals to $ 40.

24- Mr. Samir Kilani. Owner of Convertex factory.

J- Fire extinguisher costs.

The building of the factory should be equipped with automatic fire extinguishers to help prevent any hap-hazards which might arise causing heavy losses in the machinery and in the materials as well as paralyse the firm. The cost of the automatic fire extinguishers should be around $ 4,000. The life expectancy of fire extinguishers is equal to 10 years.

K- Total Cost of the Project.

Table XIII shows the different costs of the project.

TABLE XIII.

Total Capital Cost of the project

- Cost of land	$	60,000
- Cost of building construction	$	300,000
- Cost of machinery	$	730,000
- Cost of generators	$	50,000
- Cost of plastic rolls	$	5,000
- Cost of office furniture	$	5,000
- Cost of office equipment	$	3,000
- Cost of fire extinguishers	$	4,000
Total Cost of the Project	$	1,157,000.

CHAPTER V.

PROFITABILITY INDICATORS AND SENSITIVITY ANALYSIS.

A- Profitability indicators.

Profitability indicators are used to evaluate whether the project is feasible or not. Profitability indicators in this study include cash flow statement, net present value, internal rate of return, and payback period.

1- Cash Flow Analysis.

The cash flow statement includes cash inflows, cash outflows and the difference for each year of the life of the project. (table XVI, page 61).

The cash outflows (table XIV, page 59) consist of the cost of land, building costs, equipment costs, design and supervision costs, legal fees, generator costs, office furniture and equipment and other related diversities listed in chapter IV.

The cash inflows (table XV, page 60) consist of revenues arrived at by deducting operating costs and overhead from the total gross revenue.

The cash flow statement is based on a 12 year period because the plant will start producing after 2 years and the life span of the machinery is 10 years which makes an overall of 12 years.

- The residual value of the machines after 10 years of operations will be 0.
- The residual value of the building after 10 years of operations will be $ 240,000. That is total cost of building is $ 300,000 divided 50 years of life span multiplied by the remaining 40 years to get the residual value of $ 240,000.
- The residual value of land in real value will still be equal to $ 60,000 after 10 years.
- The residual value of working capital will be $ 60,000.

TABLE XIV.

CASH OUTFLOWS IN DOLLARS.

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	..Yr12
Working capital	--	60000	--	--	--	--	--
Land	60000	--	--	--	--	--	--
Building	300000	--	--	--	--	--	--
Equipment	--	292000	146000	146000	146000	--	--
Generators	--	50000	--	--	--	--	--
Rolls	--	5000	--	--	--	--	--
Office furniture	--	5000	--	--	--	--	--
Office equipment	--	3000	--	--	--	--	--
Fire extinguisher	--	4000	--	--	--	--	--
Total	360000	419000	146000	146000	146000	--	--

TABLE XV.

CASH INFLOWS IN DOLLARS.

	Yr. 1	--
	Yr. 2	--
Start of operations	Yr. 3	$ 290,000
	Yr. 4	$ 290,000
	Yr. 5	$ 290,000
	Yr. 6	$ 290,000
	Yr. 7	$ 290,000
	Yr. 8	$ 290,000
	Yr. 9	$ 290,000
	Yr. 10	$ 290,000
	Yr. 11	$ 290,000
End of operations	Yr. 12	$ 290,000
Residual value at	Yr. 12	$ 300,000
Residual value working capital	Yr. 12	$ 60,000

TABLE XVI.

Combined Cash flow statement in dollars

Year	Inflow	Outflow	Difference
1	0	360,000	(360,000)
2	0	419,000	(419,000)
3	290,000	146,000	144,000
4	290,000	146,000	144,000
5	290,000	146,000	144,000
6	290,000	0	290,000
7	290,000	0	290,000
8	290,000	0	290,000
9	290,000	0	290,000
10	290,000	0	290,000
11	290,000	0	290,000
12	290,000	0	290,000
		Residual value +	360,000

2- Internal rate of return.

The internal rate of return for an investment is the discount rate that equates the present value of the expected cash outflows with the present value of the expected cash inflows.

The formula for the IRR of this project is :

$$0 = \frac{(360,000)}{1+r} + \frac{(419,000)}{(1+r)^2} + \frac{144,000}{(1+r)^3} + \frac{144,000}{(1+r)^4} + \frac{144,000}{(1+r)^5} + \frac{290,000}{(1+r)^6} + \frac{290,000}{(1+r)^7} + \frac{290,000}{(1+r)^8} + \frac{290,000}{(1+r)^9} + \frac{290,000}{(1+r)^{10}} + \frac{290,000}{(1+r)^{11}} + \frac{650,000}{(1+r)^{12}}$$

By trial and error, we replace the value of r until we obtain the equation to be equal to 0.

The internal rate of return for the project is equal to 22.8 percent.

3- Net present value.

The Net present value represents the discounted balance between the revenue stream and the cost stream.

The cost of capital used is 10 percent.

The formula for the NPV of this project is :

$$NPV = \frac{(360,000)}{1+0.1} + \frac{(419,000)}{(1+0.1)^2} + \frac{144,000}{(1+0.1)^3} + \frac{144,000}{(1+0.1)^4} + \frac{144,000}{(1+0.1)^5} + \frac{290,000}{(1+0.1)^6} + \frac{290,000}{(1+0.1)^7} + \frac{290,000}{(1+0.1)^8} + \frac{290,000}{(1+0.1)^9} + \frac{290,000}{(1+0.1)^{10}} + \frac{290,000}{(1+0.1)^{11}} + \frac{650,000}{(1+0.1)^{12}}$$

The calculated net present value of the project is equal to $ 613,750.

4- Payback Period.

The payback period represents the time needed to repay the costs of the project.

Total cost of the project is equal to $ 1,157,000.

(see p: 56)

Net revenues per year = $ 290,000.

The first four years of operations yield a profit of $ 1,160,000.

- The payback period of the project since starting of operations is equal to 4 years.

- The payback period since the start of the project is equal to 6 years.

B- Explaining the results.

According to the results obtained, the factory is economically viable because NPV is greater than zero and because the IRR is greater than the cost of capital.

1- NPV = $ 613,750 › 0.

2- IRR = 22.8 % › Cost of Capital of 10 %.

3- Payback period = 4 years, good recovery time of money.

C- Sensitivity analysis.

The sensitivity analysis revolved under two main variables which are : 1-Price, 2- Level of production.
I have used 5 different prices ranging from $ 3.50 to $ 2.50 by a $0.25 increment. For each of these prices, I have changed the level of production three times corresponding to full production (3 shifts/day) , 2/3 production (2 shifts/day) , and 1/3 production level (1 shift/day).
I finally studied the effect of a consistent decrease in prices and raw material cost on profitability.

D- Analysing the different cases.

1- Case Price $ 3.50.

a- Full capacity : Net profit equals to $ 465,000 per year. (p: 73).

IRR equals to 39.3 % and NPV equals to $ 1,503,000. (table XVII, p: 74).

This case is highly profitable.

b- Two thirds capacity : Net profit equals to $ 273,000 per year. (p: 75).

IRR equals to 21.1 % and NPV equals to $ 528,000. (table XVIII, p: 76).

This case is highly profitable.

c- One third capacity : Net profit equals to $ 79,000 per year. (p: 77).

IRR equals to (0.9) % and NPV equals to $ (458,000). (table XIX, p: 78).

This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

2- Case Price $ 3.25.

a- Full capacity : Net profit equals to $ 378,000 per year. (p: 79).

IRR equals to 31.3 % and NPV equals to $ 1,060,000. (table XX, p: 80).

This case is highly profitable.

b- Two thirds capacity : Net profit equals to $ 214,000 per year. (p: 81).

IRR equals to 14.9 % and NPV equals to $ 228,000. (table XXI, p: 82).

This case is profitable.

c- One third capacity : This case is definitely not feasible, because at a higher price and with same capacity level of production, we incur losses.

3- Case Price $ 3.

a- Full capacity : Net profit equals to $ 290,000 per year. (p: 83).

IRR equals to 22.8 % and NPV equals to $ 614,000. (table XXII, p: 84).

This case is highly profitable.

b- Two thirds capacity : Net profit equals to $ 156,000 per year. (p: 85).

IRR equals to 8.5 % and NPV equals to $ (67,000). (table XXIII, p: 86).

This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

c- One third capacity : This case is definitely not feasible because for the same price at a higher capacity level of production, we incur losses.

4- Case Price $ 2.75.

a- Full capacity : Net profit equals to $ 203,000 per year. (p:87).

IRR equals to 13.7 % and NPV equals to $ 172,000. (table XXIV, p:88).

This case is profitable.

b- Two thirds capacity : Net profit equals to $ 98,000 per year. (p:89).

IRR equals to 1.6 % and NPV equals to $ (361,000). (table XXV, p:90).

This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

c- One third capacity : This case is definitely not feasible because for the same price at a higher capacity level of production, we incur losses.

5- Case Price $ 2.50.

a- Full capacity : Net profit equals to $ 115,000 per year. (p: 91).

IRR equals to 3.7 % and NPV equals to $ (275,000). (table XXVI, p: 92).

This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

b- Two thirds capacity and c- One third capacity : These case are definitely not feasible because for the same price at a higher capacity level of production, we incur losses.

6- Case 10 % decrease in price and raw material.

a- Full capacity : Net profit equals to $ 244,000 per year. (p: 93).
IRR equals to 18.1 % and NPV equals to $ 380,000.
(table XXVII, p: 94).
This case is feasible.

b- Two thirds capacity : Net profit equals to $ 125,000 per year. (p: 95).
IRR equals to 4.9 % and NPV equals to $ (224,000).
(table XXVIII, p: 96).
This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

c- One third capacity : This case is definitely not feasible because for the same price at a higher capacity level of production, we incur losses.

7- Case 20 % decrease in price and raw material.

a- Full capacity : Net profit equals to $ 198,000 per year. (p: 97).

IRR equals to 13.2 % and NPV equals to $ 147,000. (table XXIX, p: 98).

This case is feasible.

b- Two thirds capacity : Net profit equals to $ 94,000 per year. (p: 99).

IRR equals to 1.1 % and NPV equals to $ (381,000). (table XXX, p: 100).

This case is not feasible because IRR < Cost of capital and because NPV < 0. In this case we incur losses.

c- One third capacity : This case is definitely not feasible because for the same price at a higher capacity level of production, we incur losses.

Selling price per kg : $3.50			
Capacity production : 3/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			1,225,000
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$588,000		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$647,000	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$760,000
Net Profit per year (rounded)			$465,000

TABLE XVII.

CASH FLOW STATEMENT

Selling price = $3.50
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	465,000	146,000	319,000
	4	465,000	146,000	319,000
	5	465,000	146,000	319,000
	6	465,000	0	465,000
	7	465,000	0	465,000
	8	465,000	0	465,000
	9	465,000	0	465,000
	10	465,000	0	465,000
	11	465,000	0	465,000
End oper	12	465,000	0	465,000
Residual value	12	360,000		

IRR = 39.3%

NPV = 1,502,429

Selling price per kg : $3.50			
Capacity production : 2/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			816,667
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$392,000		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$431,333	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$544,000
Net Profit per year (rounded)			$273,000

TABLE XVIII.

CASH FLOW STATEMENT

Selling price = $3.50
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	273,000	146,000	127,000
	4	273,000	146,000	127,000
	5	273,000	146,000	127,000
	6	273,000	0	273,000
	7	273,000	0	273,000
	8	273,000	0	273,000
	9	273,000	0	273,000
	10	273,000	0	273,000
	11	273,000	0	273,000
End oper	12	273,000	0	273,000
Residual value	12	360,000		

IRR = 21.1%

NPV = 527,423

Selling price per kg : $3.50			
Capacity production : 1/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			408,333
Costs			
Variable costs			
Labour wages	$10,000		
Raw material	$196,000		
Fuel cost	$9,500		
Utilities	$167		
Total variable costs		$215,667	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$329,000
Net Profit per year (rounded)			$79,000

TABLE XIX.

CASH FLOW STATEMENT

Selling price = $3.50
Capacity = 1/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	79,000	146,000	(67,000)
	4	79,000	146,000	(67,000)
	5	79,000	146,000	(67,000)
	6	79,000	0	79,000
	7	79,000	0	79,000
	8	79,000	0	79,000
	9	79,000	0	79,000
	10	79,000	0	79,000
	11	79,000	0	79,000
End oper	12	79,000	0	79,000
Residual value	12	360,000		

IRR = -0.9%

NPV = (457,739)

Selling price per kg : $3.25			
Capacity production : 3/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			1,137,500
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$588,000		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$647,000	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$760,000
Net Profit per year (rounded)			$378,000

TABLE XX.

CASH FLOW STATEMENT

Selling price = $3.25
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	378,000	146,000	232,000
	4	378,000	146,000	232,000
	5	378,000	146,000	232,000
	6	378,000	0	378,000
	7	378,000	0	378,000
	8	378,000	0	378,000
	9	378,000	0	378,000
	10	378,000	0	378,000
	11	378,000	0	378,000
End oper	12	378,000	0	378,000
Residual value	12	360,000		

IRR = 31.3%

NPV = 1,060,629

Selling price per kg : $3.25			
Capacity production : 2/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			758,333
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$392,000		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$431,333	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$544,000
Net Profit per year (rounded)			$214,000

TABLE XXI.

CASH FLOW STATEMENT

Selling price = $3.25
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	214,000	146,000	68,000
	4	214,000	146,000	68,000
	5	214,000	146,000	68,000
	6	214,000	0	214,000
	7	214,000	0	214,000
	8	214,000	0	214,000
	9	214,000	0	214,000
	10	214,000	0	214,000
	11	214,000	0	214,000
End oper	12	214,000	0	214,000
Residual value	12	360,000		

IRR = 14.9%

NPV = 227,812

Selling price per kg :	$3.00
Capacity production :	3/3 Capacity
Full capacity of Raffia :	350,000 Kgs.

Revenues			1,050,000
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$588,000		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$647,000	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$760,000
Net Profit per year (rounded)			$290,000

TABLE XXII.

CASH FLOW STATEMENT

Selling price = $3.00
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	290,000	146,000	144,000
	4	290,000	146,000	144,000
	5	290,000	146,000	144,000
	6	290,000	0	290,000
	7	290,000	0	290,000
	8	290,000	0	290,000
	9	290,000	0	290,000
	10	290,000	0	290,000
	11	290,000	0	290,000
End oper	12	290,000	0	290,000
Residual value	12	360,000		

IRR = 22.8%

NPV = 613,752

Selling price per kg :	$3.00	
Capacity production :	2/3 Capacity	
Full capacity of Raffia :	350,000 Kgs.	

Revenues			700,000
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$392,000		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$431,333	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$544,000
Net Profit per year (rounded)			$156,000

TABLE XXIII.

CASH FLOW STATEMENT

Selling price = $3.00
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	156,000	146,000	10,000
	4	156,000	146,000	10,000
	5	156,000	146,000	10,000
	6	156,000	0	156,000
	7	156,000	0	156,000
	8	156,000	0	156,000
	9	156,000	0	156,000
	10	156,000	0	156,000
	11	156,000	0	156,000
End oper	12	156,000	0	156,000
Residual value	12	360,000		

IRR = 8.5%

NPV = (66,721)

Selling price per kg : $2.75			
Capacity production : 3/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			962,500
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$588,000		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$647,000	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$760,000
Net Profit per year (rounded)			$203,000

TABLE XXIV.

CASH FLOW STATEMENT

Selling price = $2.75
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	203,000	146,000	57,000
	4	203,000	146,000	57,000
	5	203,000	146,000	57,000
	6	203,000	0	203,000
	7	203,000	0	203,000
	8	203,000	0	203,000
	9	203,000	0	203,000
	10	203,000	0	203,000
	11	203,000	0	203,000
End oper	12	203,000	0	203,000
Residual value	12	360,000		

IRR = 13.7%

NPV = 171,952

Selling price per kg : $2.75			
Capacity production : 2/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			641,667
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$392,000		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$431,333	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$544,000
Net Profit per year (rounded)			$98,000

TABLE XXV.

CASH FLOW STATEMENT

Selling price = $2.75
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	98,000	146,000	(48,000)
	4	98,000	146,000	(48,000)
	5	98,000	146,000	(48,000)
	6	98,000	0	98,000
	7	98,000	0	98,000
	8	98,000	0	98,000
	9	98,000	0	98,000
	10	98,000	0	98,000
	11	98,000	0	98,000
End oper	12	98,000	0	98,000
Residual value	12	360,000		

IRR = 1.6%

NPV = (361,254)

Selling price per kg : $2.50			
Capacity production : 3/3 Capacity			
Full capacity of Raffia : 350,000 Kgs.			
Revenues			875,000
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$588,000		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$647,000	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$760,000
Net Profit per year (rounded)			$115,000

TABLE XXVI.

CASH FLOW STATEMENT

Selling price = $2.50
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	115,000	146,000	(31,000)
	4	115,000	146,000	(31,000)
	5	115,000	146,000	(31,000)
	6	115,000	0	115,000
	7	115,000	0	115,000
	8	115,000	0	115,000
	9	115,000	0	115,000
	10	115,000	0	115,000
	11	115,000	0	115,000
End oper	12	115,000	0	115,000
Residual value	12	360,000		

IRR = 3.7%

NPV = (274,925)

Case decrease in both, price and raw material by 10 % .

Selling price per kg :	$3.00
New selling price per kg :	$2.70
Capacity production :	3/3 Capacity
Full capacity of Raffia :	350,000 Kgs.

Revenues			945,000
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$529,200		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$588,200	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$701,000
Net Profit per year (rounded)			$244,000

TABLE XXVII.

Decrease in both, price and raw material by 10 %

CASH FLOW STATEMENT

Selling price = $2.70
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	244,000	146,000	98,000
	4	244,000	146,000	98,000
	5	244,000	146,000	98,000
	6	244,000	0	244,000
	7	244,000	0	244,000
	8	244,000	0	244,000
	9	244,000	0	244,000
	10	244,000	0	244,000
	11	244,000	0	244,000
End oper	12	244,000	0	244,000
Residual value	12	360,000		

IRR = 18.1%

NPV = 380,157

Case decrease in both, price and
raw material by 10 % .

Selling price per kg :	$3.00	
New selling price per kg :	$2.70	
Capacity production :	2/3 Capacity	
Full capacity of Raffia :	350,000 Kgs.	

Revenues			630,000
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$352,800		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$392,133	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$505,000
Net Profit per year (rounded)			$125,000

TABLE XXVIII.

Decrease in both, price and raw material by 10 %

CASH FLOW STATEMENT

Selling price = $2.70
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	125,000	146,000	(21,000)
	4	125,000	146,000	(21,000)
	5	125,000	146,000	(21,000)
	6	125,000	0	125,000
	7	125,000	0	125,000
	8	125,000	0	125,000
	9	125,000	0	125,000
	10	125,000	0	125,000
	11	125,000	0	125,000
End oper	12	125,000	0	125,000
Residual value	12	360,000		

IRR = 4.9%

NPV = (224,144)

Case decrease in both, price and raw material by 20 % .

Selling price per kg :	$3.00
New selling price per kg :	$2.40
Capacity production :	3/3 Capacity
Full capacity of Raffia :	350,000 Kgs.

Revenues			840,000
Costs			
Variable costs			
Labour wages	$30,000		
Raw material	$470,400		
Fuel cost	$28,500		
Utilities	$500		
Total variable costs		$529,400	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$642,000
Net Profit per year (rounded)			$198,000

TABLE XXIX.

Decrease in both, price and raw material by 20 %

CASH FLOW STATEMENT

Selling price = $2.40
Capacity = 3/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	198,000	146,000	52,000
	4	198,000	146,000	52,000
	5	198,000	146,000	52,000
	6	198,000	0	198,000
	7	198,000	0	198,000
	8	198,000	0	198,000
	9	198,000	0	198,000
	10	198,000	0	198,000
	11	198,000	0	198,000
End oper	12	198,000	0	198,000
Residual value	12	360,000		

IRR = 13.2%

NPV = 146,562

Case decrease in both, price and
raw material by 20 % .

Selling price per kg :	$3.00
New selling price per kg :	$2.40
Capacity production :	2/3 Capacity
Full capacity of Raffia :	350,000 Kgs.

Revenues			560,000
Costs			
Variable costs			
Labour wages	$20,000		
Raw material	$313,600		
Fuel cost	$19,000		
Utilities	$333		
Total variable costs		$352,933	
Fixed costs			
Salaries	$23,400		
Office supplies	$3,600		
Depreciation			
Building	$6,000		
Machinery	$73,000		
Generators	$5,000		
Plastic rolls	$500		
Office furniture	$500		
Office equipment	$300		
Fire extinguisher	$400		
Total fixed cost (rounded)		$113,000	
Total Costs (rounded)			$466,000
Net Profit per year (rounded)			$94,000

TABLE XXX.

Decrease in both, price and raw material by 20 %

CASH FLOW STATEMENT

Selling price = $2.40
Capacity = 2/3

	YEAR	INFLOW	OUTFLOW	DIFFERENCE
	1	0	360,000	(360,000)
	2	0	419,000	(419,000)
Beg. oper	3	94,000	146,000	(52,000)
	4	94,000	146,000	(52,000)
	5	94,000	146,000	(52,000)
	6	94,000	0	94,000
	7	94,000	0	94,000
	8	94,000	0	94,000
	9	94,000	0	94,000
	10	94,000	0	94,000
	11	94,000	0	94,000
End oper	12	94,000	0	94,000
Residual value	12	360,000		

IRR = 1.1%

NPV = (381,567)

CHAPTER VI.

CONCLUSIONS AND RECOMMENDATIONS.

A- Conclusions and Recommendations.

1- The preceding analysis of the feasibility of setting-up in Lebanon a factory producing Raffia bags was made under the assumption that the available funds to be invested in this project were about one million and a quarter U.S. dollars.

2- This led to the choice of a factory with a total production capacity of 350 ton of Raffia bags per year (working 3 shifts per day) which roughly corresponds to the capacity level of each of the four other plants presently operating in Lebanon.

- Based on interviews with local producers and on a comparison of import prices with costs of production, it was determined that economies of scale were not significant in this industry and that a firm of the proposed size would be competitive in Lebanon even without protection, provided a high efficiency level was maintained in production.

3- Analysis of demand showed that it currently amounts to 3,600 ton per year, half of which is satisfied by local producers, the other half being covered by the imports. The current market price is about $ 3 / kg.

4- The location of the factory was chosen in an industrial zone on the basis of five criteria : cost of land, availability of labour in the area, transportation facilities, proximity to major market outlets, and security conditions. The locality of Matin was judged to be best suited for the project. The cost of 2000 squared meters of land in this area was estimated at $ 60,000.

5- The total capital to be invested in the project is $ 1,217,000. This is divided into fixed assets : land ($60,000), building ($300,000), machines, equipment, furniture ($797,000) and working capital of ($60,000).

6- Under the assumption that full-scale production [25] will be sold at the current market price $ 3 / kg, the gross revenues per year will be $ 1,050,000 after start of operations. The cost of goods sold will be $ 760,000. Net revenues per year will then be $ 290,000.

25- Full scale production is defined here as 3 shifts/day working at 95 % of theoretical full capacity.

7- The cost of capital on dollar investment was estimated to be 10 %. Under the assumption that full-scale production will be sold at the current market rate of $ 3 / kg, the net present value was calculated to be $ 613,752, the IRR was found to be 22.8 %, the payback period to be 6 years. If only two shifts operate per day, the IRR falls to 8.3 % which is lower than the cost of capital, thus we incur losses.

8- The sensitivity analysis also showed that at an inflated price of $ 3.5 / kg of Raffia bags, working 3 shifts/day will be highly profitable with an IRR of 39.3 %, for that same price, working 2 shifts/day will also be highly profitable with an IRR of 21.1 %. On the other hand working 1 shift/day will produce losses because IRR equals (0.9) %.

At a price of $ 3.25 / kg, working 3 shifts/day will be highly profitable with an IRR of 31.3 %, for that same price, working 2 shifts/day will be slightly profitable with an IRR of 14.9 %. On the other hand we incur losses at a lower production level.

At a reduced price of $ 2.75 / kg of Raffia bags, working 3 shifts/day will be slightly profitable with an IRR of 13.7 %, whereas in two shifts/day, we incur losses. If prices fall to $ 2.5 / kg, 3 shifts/day the IRR equals to 3.7 % which is lower than the cost of capital, thus we incur losses.

9- Since selling prices of imported Raffia bags is $ 3.0-3.3/kg, it is unlikely that the price of Raffia bags will fall below $ 2.9/kg except as a result of a decrease in raw material cost.

A proportional decrease in prices and raw materials cost by 10 % will cause a decrease in IRR but not enough to change our conclusions concerning profitability at each capacity level. A 20 % decrease in prices and raw materials cost would, however make the project marginally profitable (IRR = 13.2 %) at full capacity levels, whereas IRR was 22.8 % if no such decrease is assumed.

10- The re-establishment of the authority of the state in Lebanon and the return to political and economic security would greatly improve the profitability aspects of the project. Efficiency then could conceivably approach the theoretical maximum. Custom duties would be collected again, raising import prices and market prices in Lebanon. Finally it would become possible to obtain low interest long-term loans for industrial projects, further increasing the profitability of the project.

11- There is one possible scenario which could seriously affect the viability of the project. If an oil-producing country with a developed petrochemical industry started producing Raffia bags and selling at very low prices (perhaps a way to go around quota regulations) without a decrease in the price of polypropylene granules. Though Western countries, highly influential in the oil-producing countries, have severe constraints on the development of petrochemical industry in these countries to protect their own, it would be advisable to consider locating the factory in an oil-producing country before going ahead with the project in Lebanon.

12- Our final recommendation concerning the advisability of setting-up a factory producing Raffia bags in Lebanon is not very clear-cut. It would seem best to wait a few months for possibly favourable political developments. During the waiting period, a study should be made of the possibilities of setting-up the plant in an oil-producing country also producing the polypropylene granules. Should the situation return to normal in Lebanon, and should the prospects for medium-term economic and political stability appear good, then our recommendation would be to implement the project in Lebanon independently of the results of the study of locating the plant elsewhere.

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INTERVIEWS

- Mr. Samir Kilani, owner of "Convertex" factory.

- Mr. Ahmad Chebarek, owner of "Sharikat Al-Masharii Al Koubra" factory.

- Mr. Sakr Fakhry, Civil engineer.

- Miss Rita Ayoub, responsible in the research department in the Chamber of Industry and Trade.

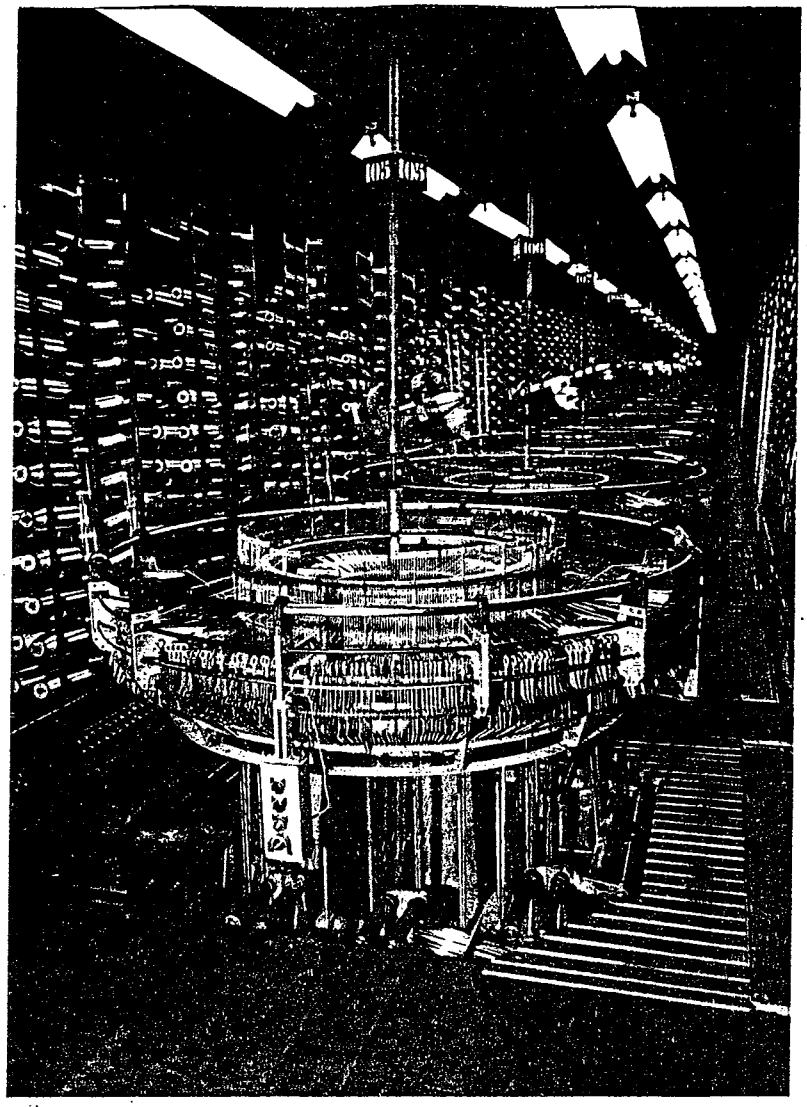
- Miss Doha Malek, responsible in the research department in the Chamber of Industry and Trade.

- Mr. Youssef Afra, a reputable land broker.

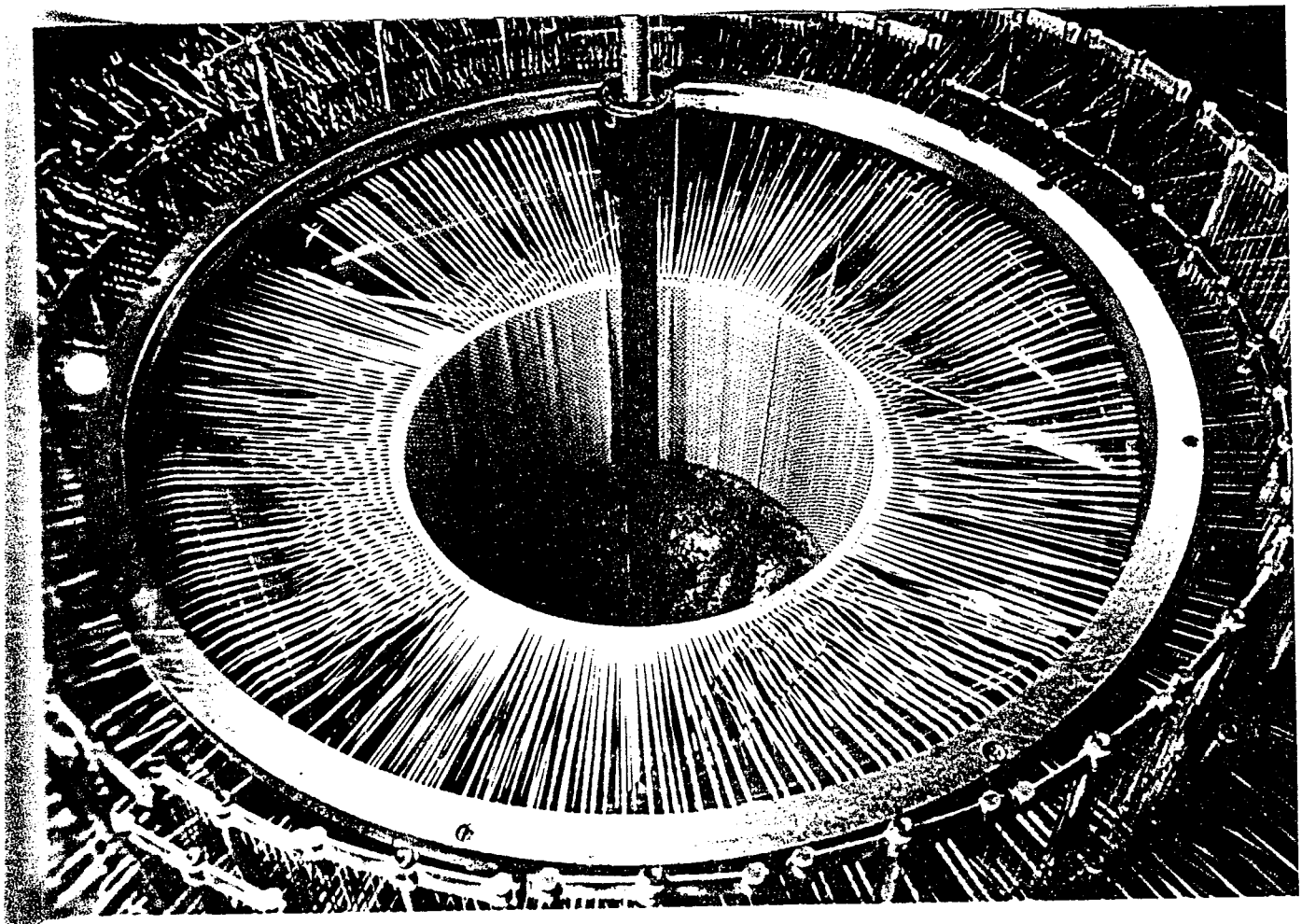
- Mr. Wadii Najjar, an importer of Raffia bags.

APPENDIX

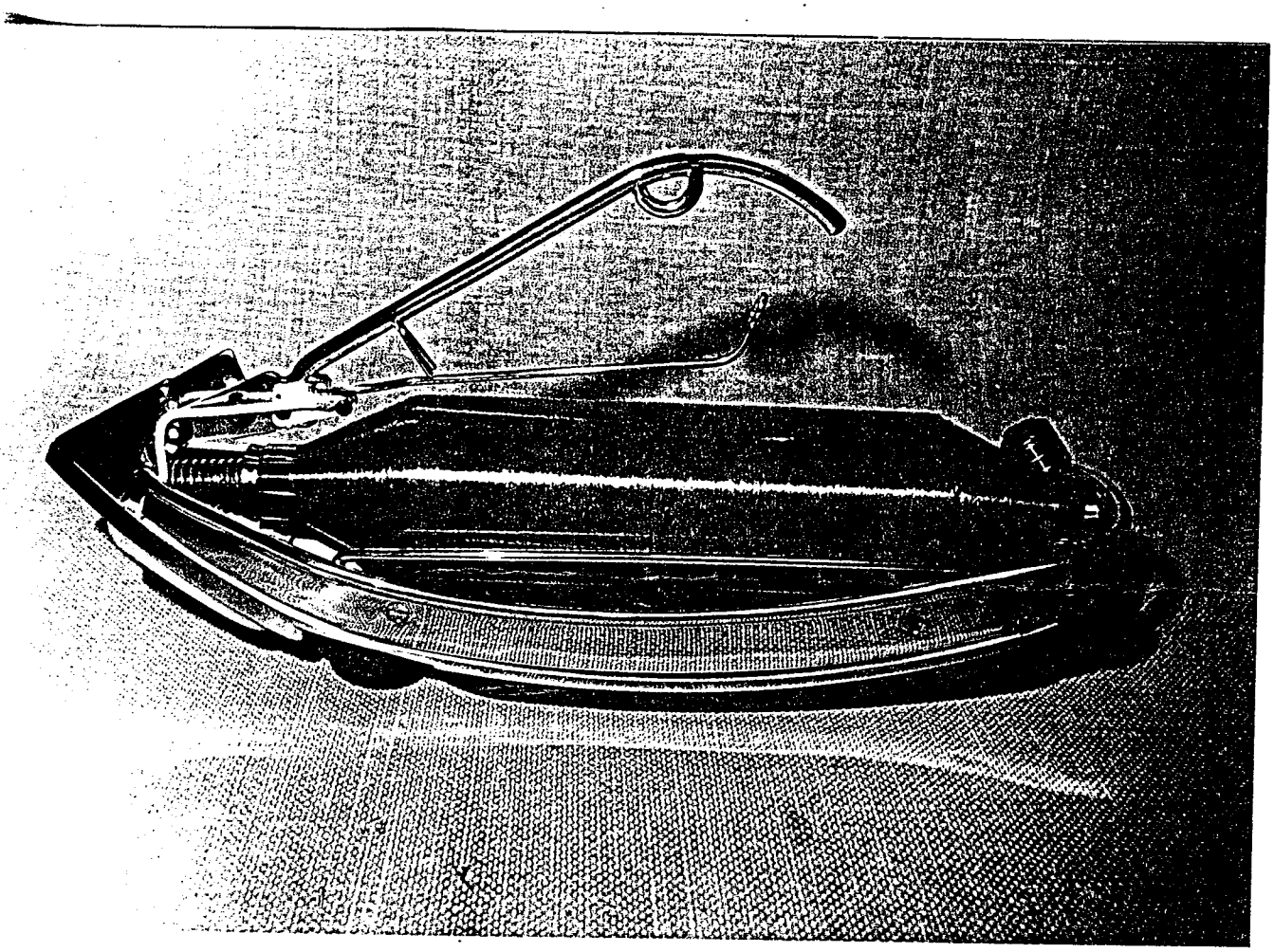
PICTURE	NAME
A1	LINE of SP 6 circular weaving looms
A2	SP 6 circular weaving loom : detail
A3	SP 6 circular loom : the shuttle
A4	SP 6 circular weaving loom on erection state
A5	SP 6 circular weaving loom : unrolling device
A6	Inspecting and thermocutting machine
A7	Semi-automatic sewing machine
A8	184 spindle winder
A9	Circular weaving loom on horizontal disposition
A10	Circular weaving loom on horizontal disposition
A11	Part I
A12	Part II - 1
A13	Part II - 2
A14	Spindle winder, Drum machine
A15	Extruding machine



Line of SP 6 circular weaving looms

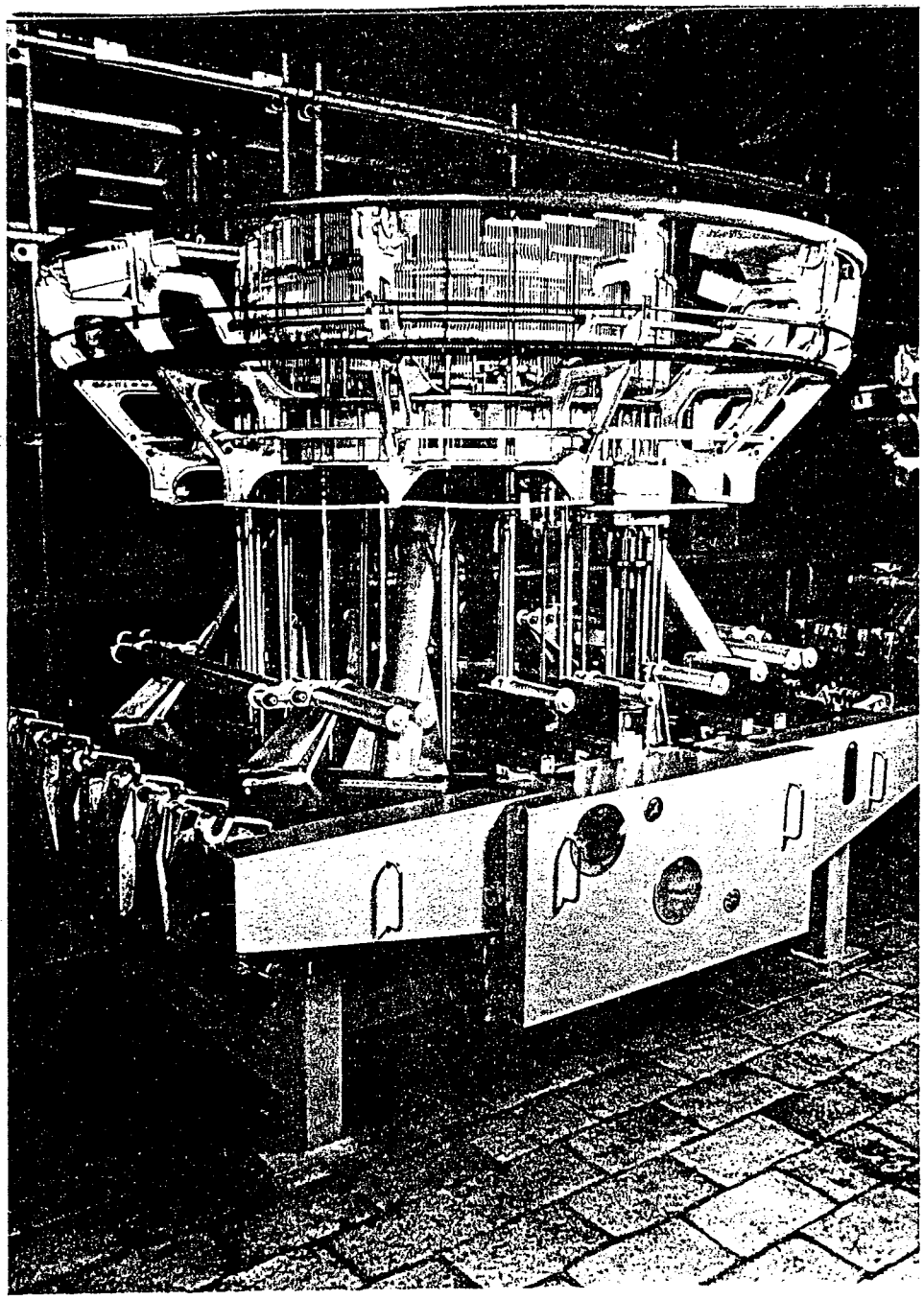


SP 6 circular weaving loom : detail



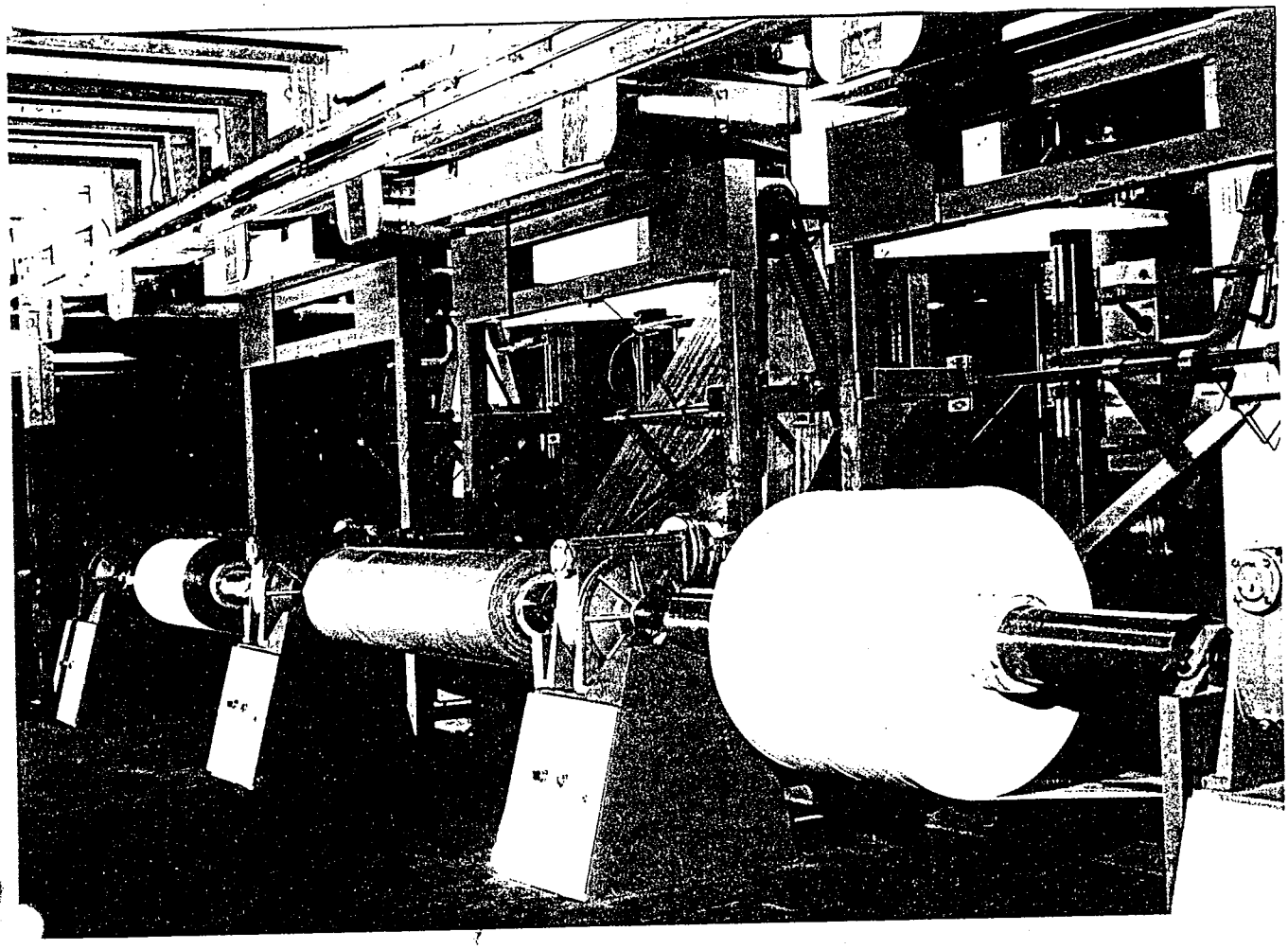
SP 6 circular loom : the shuttle

A3



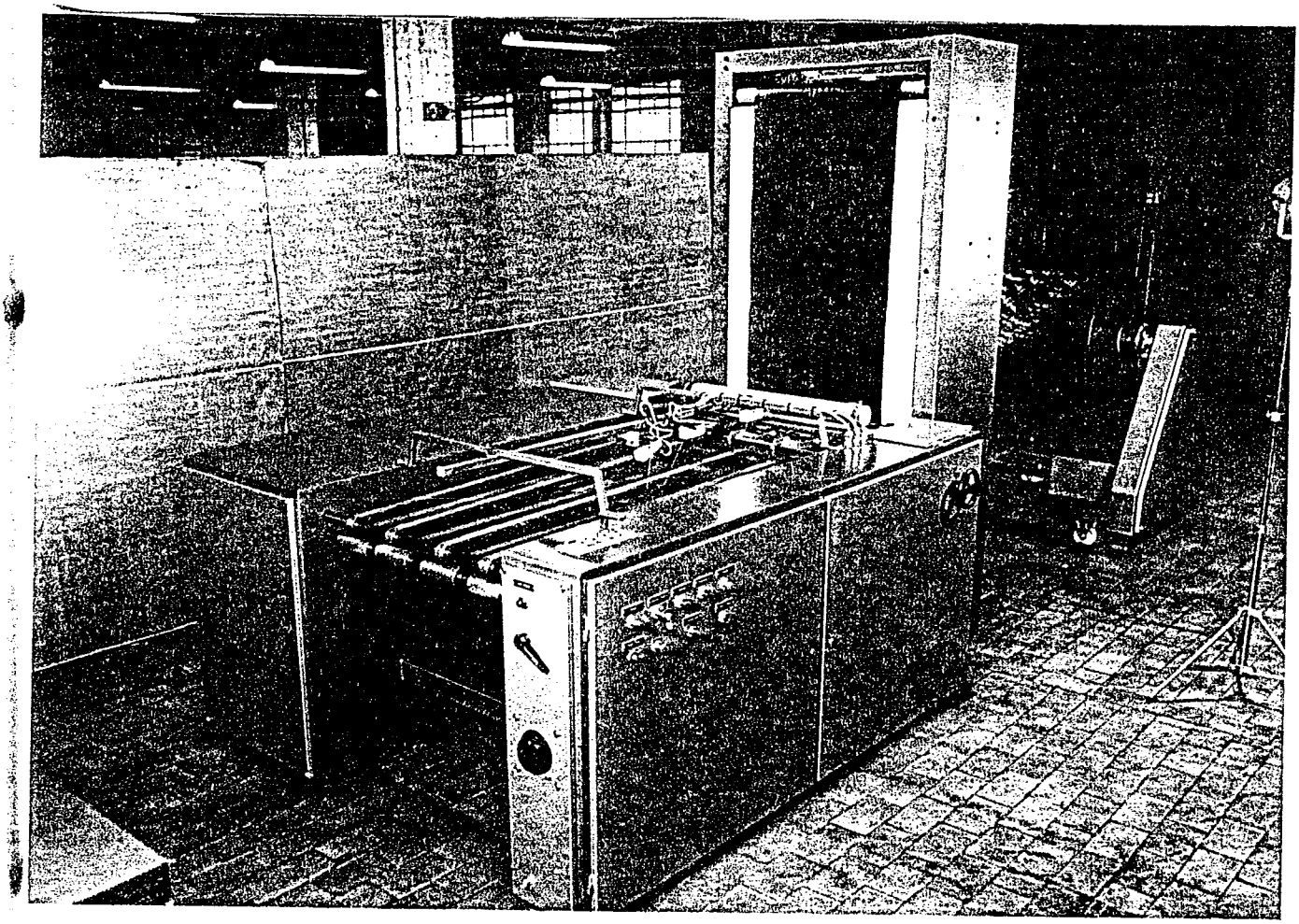
SP6 circular weaving loom
on erection state

A4



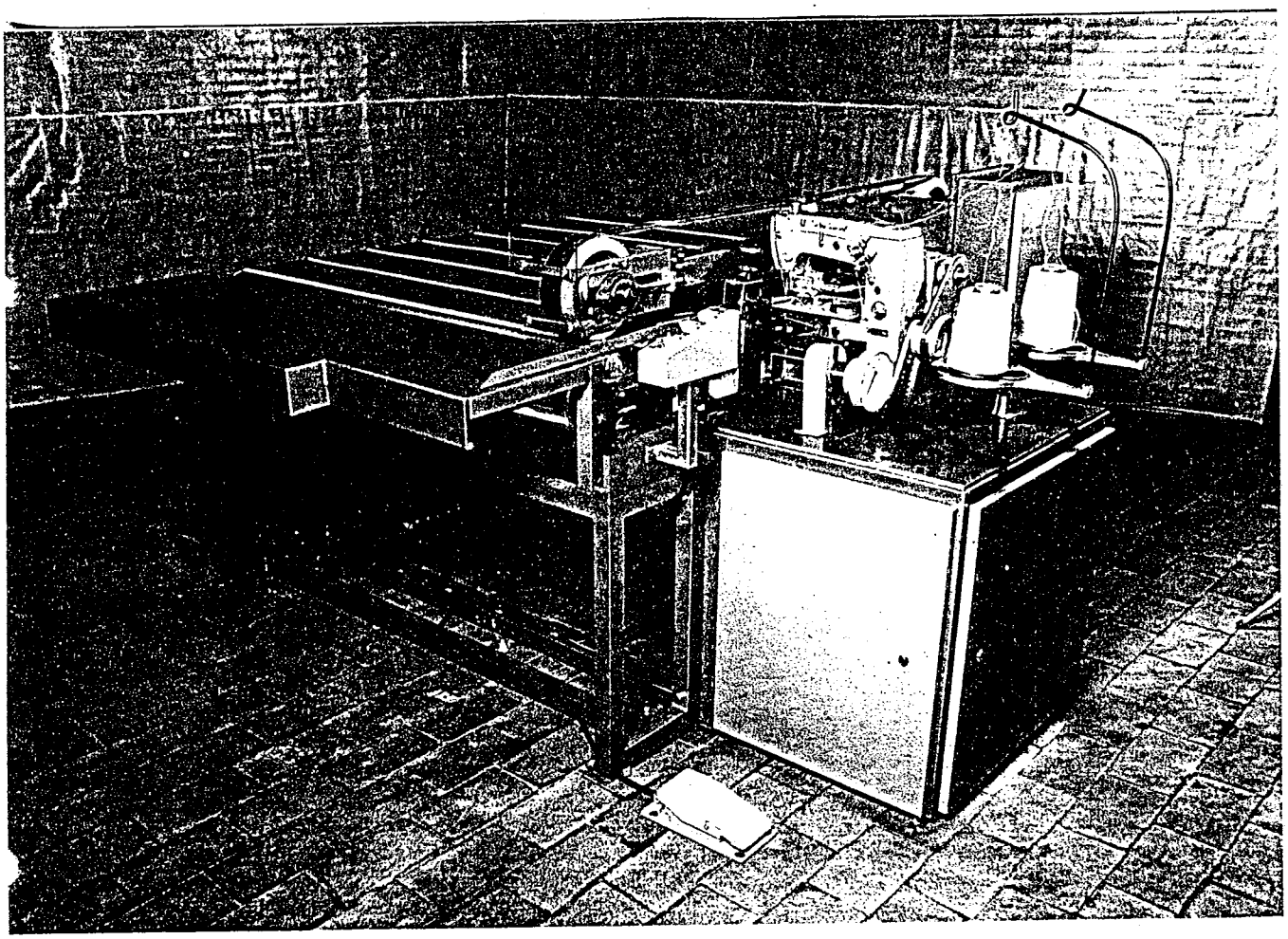
SP6 circular weaving loom : unrolling device

A5



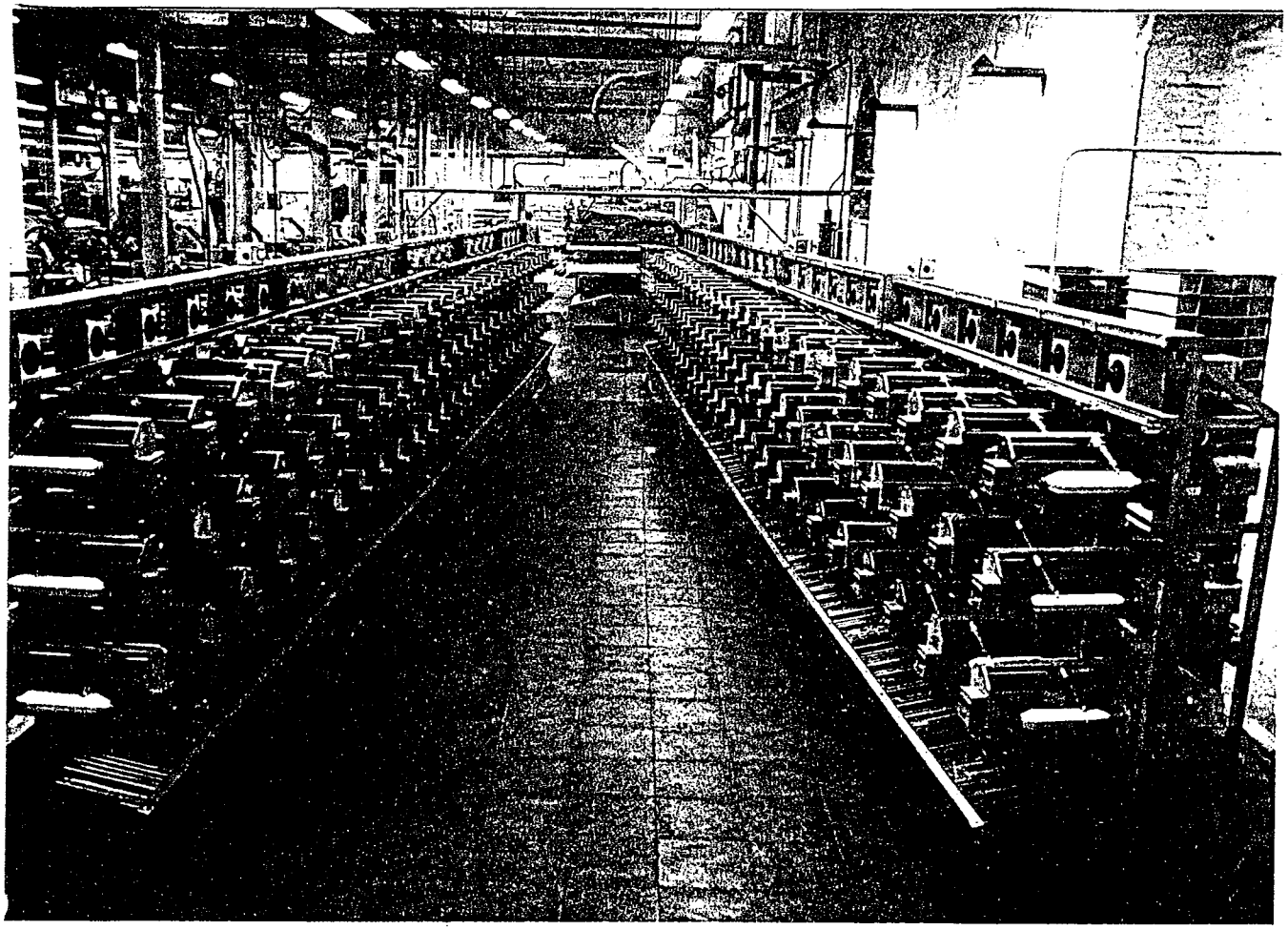
Inspecting and thermocutting machine

A6



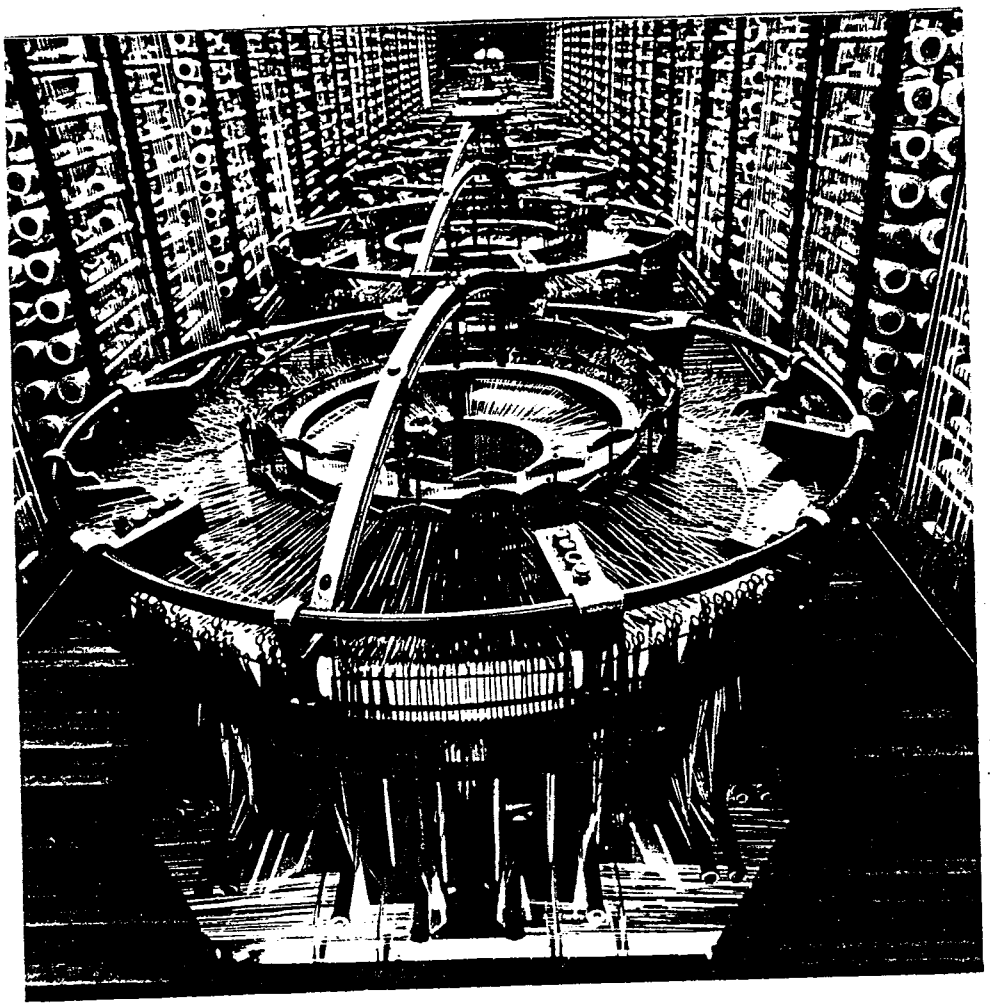
Semi-automatic sewing machine

A7



184 spindle winder

A8

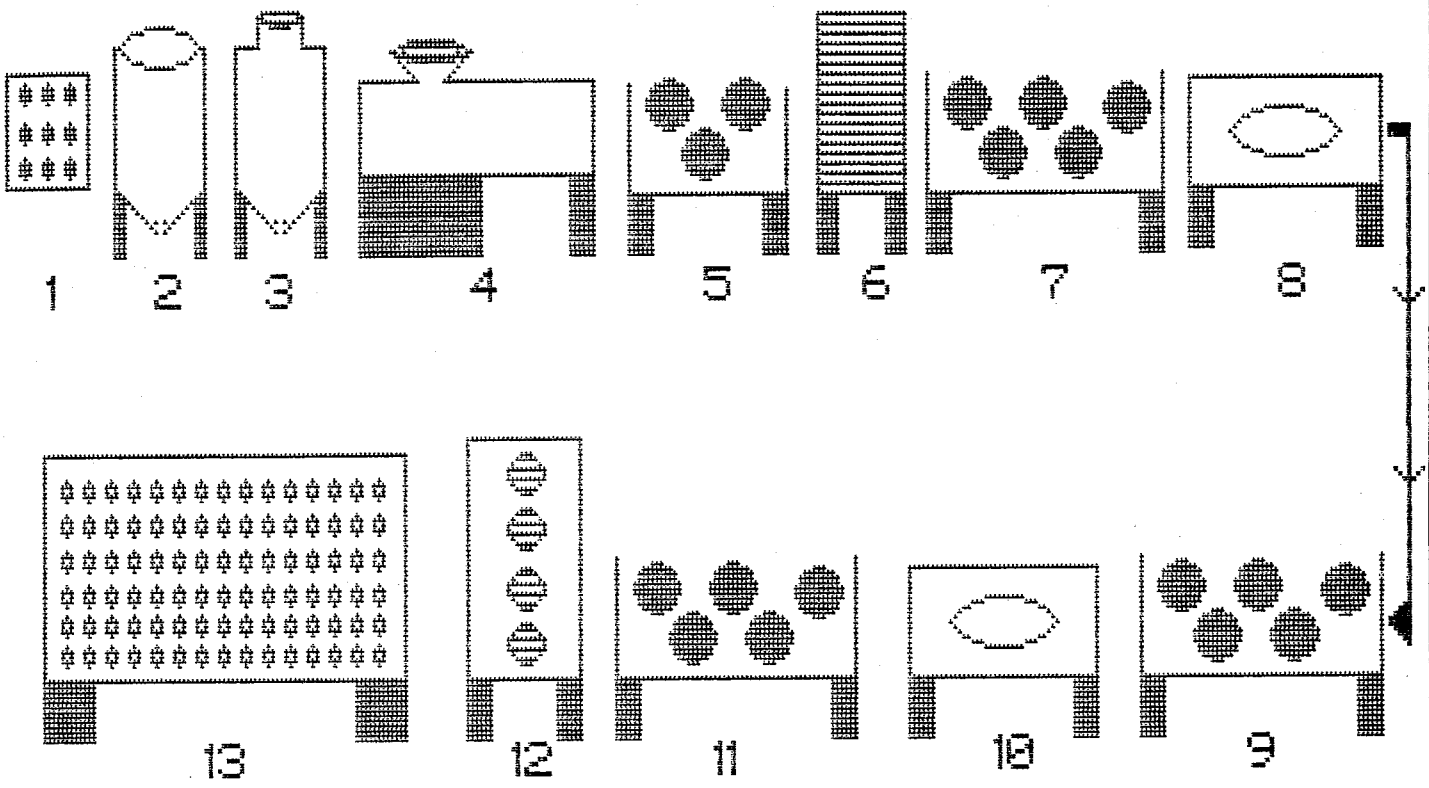


Circular weaving loom SJ7 on horizontal disposition

Detail

A10

Part I.



1- Raw Material

2- Mixer

3- Cilo

4- Extruding machine

5- Drum with 3 cylinders

6- Cutter

7- Drum with 5 cylinders

8- Oven at 130° C.

9- Drum with 5 cylinders

10- Oven at 100° C.

11- Drum with 5 cylinders

12- Cutter

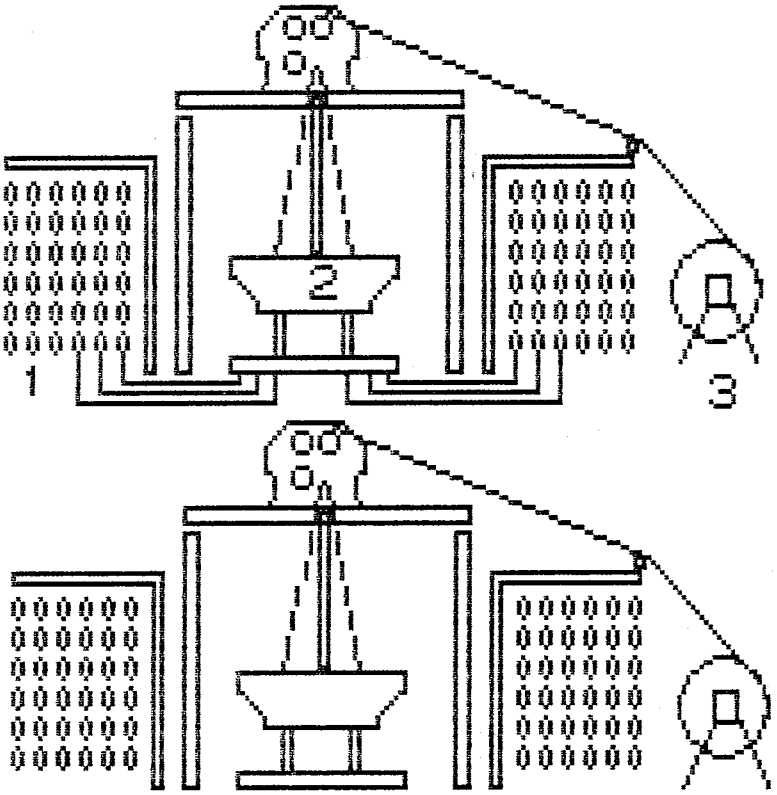
13- Spindle Winder

Part II - 1.

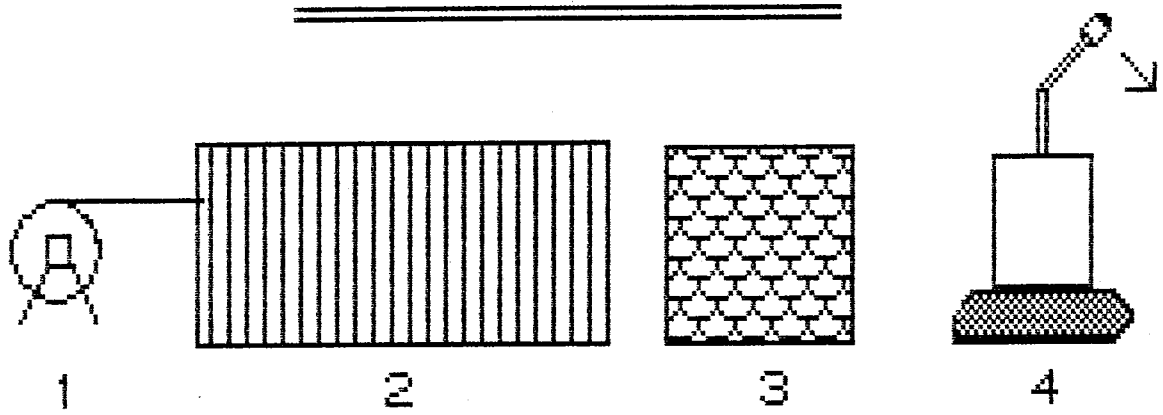
1-Rolls

2-Circular Weaving Loom

3- Rolling & Un-rolling Device



Part II - 2.



1-Rolling & Unrolling Device.

2-Inspecting & Thermocutting Machine.

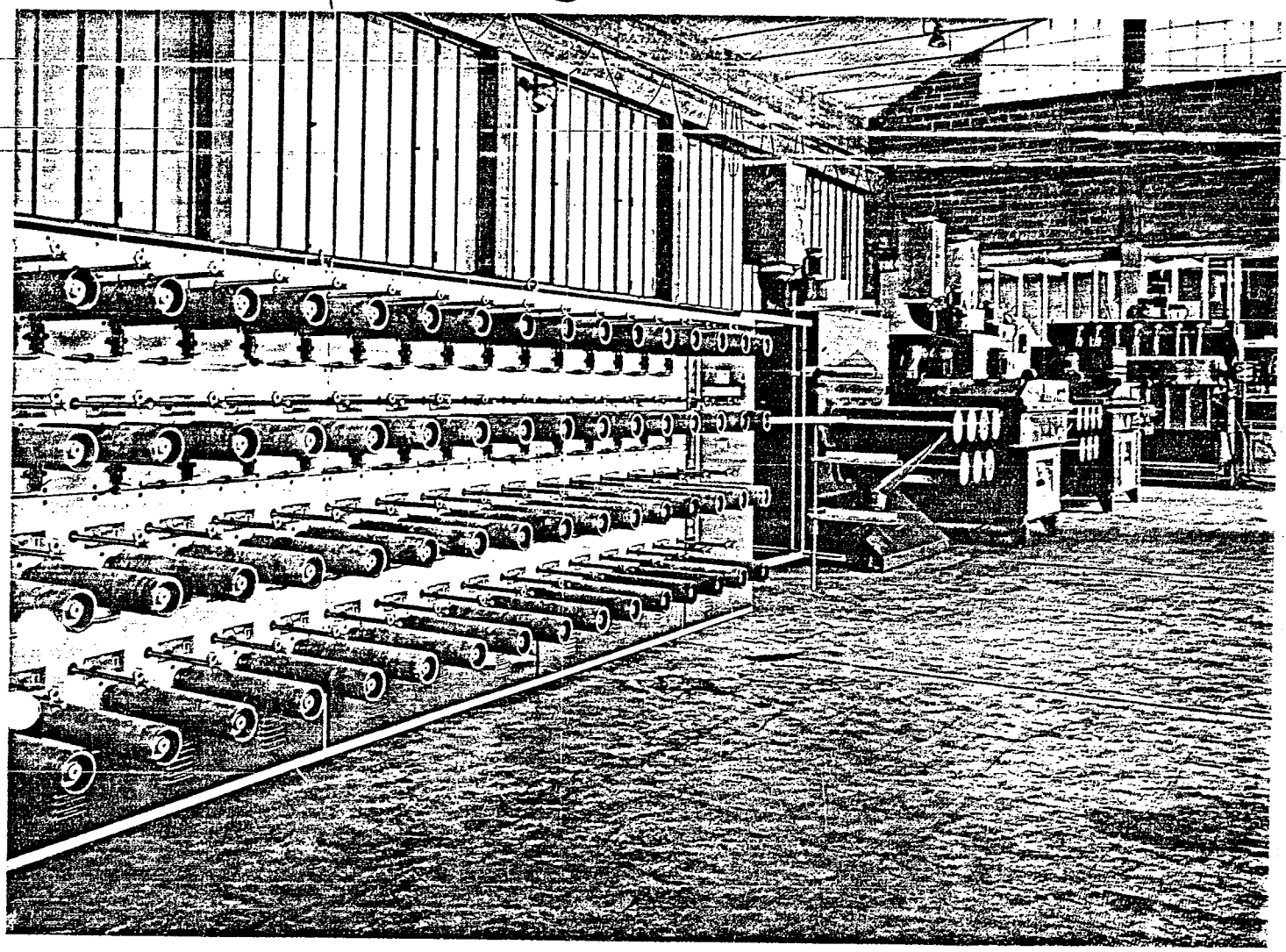
3-Semi - Automatic Sewing Machine.

4-Bailing Press.

5

5-Finished Products.

Spindle Winder

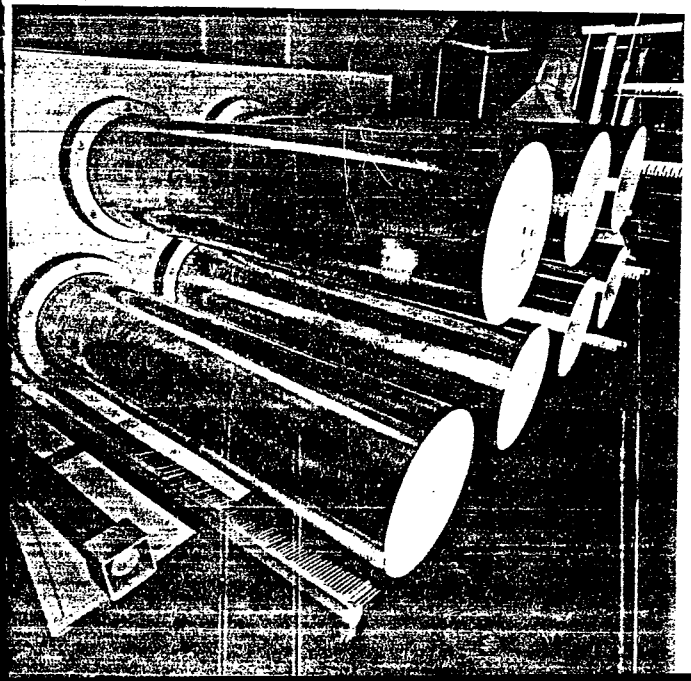


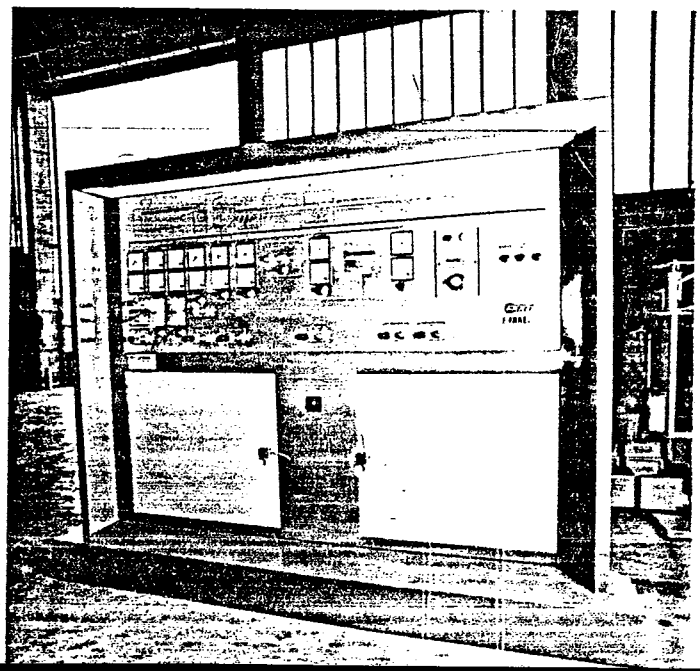
A 14

Impianto completo
per la produzione
di multifili PP e NYLON

Complete line
for the production
of PP and PA multifilament

, DRUM Machine





FARE'

"MULTIFILAMENT"