

1.
METHOD OF PRODUCING MATS OF MINERAL FIBRES FROM A MOLTEN
MATERIAL

2173523

The invention relates to techniques for producing mats of mineral fibres.

Industrially, the most widespread method of forming felts of mineral fibres resides in forming the fibres from the molten material by passing this material through a centrifuge the periphery of which is provided with orifices. The molten material is ejected from the centrifuge through these orifices in the form of filaments. A hot and high velocity gaseous current passes over the peripheral walls of the centrifuge and entrains the filaments, completing the process of drawing them.

This method of producing fibre mats has been the object of many publications. Of the most recent, mention may be made of French Patent Application No. 2 443 436 and European Patent Application No. 0 091 866.

When fibre mats are produced, a not inconsiderable proportion of by-products are created. First of all, there are the selvages or borders of the mats which are systematically cut off to adjust the transverse dimensions and ensure perfect straightness of the edges. Then there are all the products which are extracted from the production line at any point along it because they do not correspond to the standards chosen. Taken as a whole, these fibre products may represent up to 10% or more of the whole production. According to circumstances, these by-products may be either rejected or re-used after conversion.

Traditionally, in the mat forming technique to which reference has been made previously, at least a part of these by-products is reincorporated into the mat manufacturing process. To this end, the by-products used are first of all
5 restored to the form of small dimension particles or nodules by a suitable crushing or shredding operation. The resultant fibrous particles are carried by a gaseous stream to an enclosure where the fibre mat is formed, where they are more or less thoroughly blended with the fibres which have just been formed
10 before the latter are collected on a receiving means.

Coming back to the production of fibre mats, it is necessary to stipulate the conditions under which the fibres emerging from the centrifuge are treated in order to constitute a mat.

15 Each centrifuge has on its periphery a very large number of orifices and all the fibres formed, entrained by the gaseous flow passing over the centrifuge constitute a kind of very regular annular film which extends in the direction of a receiving conveyor.

20 The conveyor, which is permeable to gases, retains the fibres while allowing passage of the carrier gases which are drawn into compartments located beneath the conveyor and maintained in a vacuum by appropriate means.

Furthermore, in their path between the centrifuge and
25 the receiving conveyor, the fibres receive a sprayed-on binder designed to fix them to one another in stable form in the resultant mat. Coating of the fibres is conventionally completed by a heat treatment to fix the binder, an operation which is carried out after the mat has been formed by the

fibres becoming inter-tangled on the receiving conveyor.

In industrial installations, when the required output is considerable, several centrifuges aligned above one and the same conveyor contribute to formation of the same mat.

5 When it is performed, the introduction of fibre particles is traditionally carried out between successive centrifuges. By incorporating the introduction of fibre particles between two newly formed fibre sources, every effort is made to obtain a suitable mixture so that the distribution of particles
10 within the mat is relatively homogeneous.

It is indeed important for the properties of the mats formed that the particles be properly distributed throughout the mass of the mat. Indeed, if taken as a whole with regard to the fundamental properties of the mat, the particles behave
15 liek the newly formed fibres, particularly in terms of heat resistance, their presence may bring about more or less substantial changes in properties such as the mechanical resistance or the appearance of the product.

Generally, it is preferable for changes, when they
20 happen, to affect the product uniformly. On the other hand, the modifications in question are only substantially manifest in particle contents which exceed certain limits. If the particles are property distributed throughout the mat, it is possible to increase the quantity of particles without the
25 risk of exceeding these limits at any one point in the mat.

Experience has shown that the conventional methods of introducing particles into the flow of fibres do not produce a perfectly homogeneous distribution. The particles have a tendency to become deposited in the form of layers which are

more or less well integrated in the mass of newly formed fibres.

Schematically, analysis of the mat in its thickness would seem to show that each centrifuge leads to the deposit-
5 ing of a "layer" of fibres. Introduction of the particles between two centrifuges will under these conditions and in privileged fashion result in the deposition of particles between the layers corresponding to these centrifuges.

The distribution of fibres over the width of the con-
10 veyor also conventionally poses problems when the conveyor is relatively wide, for example when its width is as much as or in excess of 2 m. To ensure that the distribution of fibres is sufficiently regular over all the width, means are normally adopted which either encourage the widening of the flow of
15 gases carrying the fibres (for example jets of gas directed transversely to the normal path "standardise" the sheet of fibres), or periodically change the direction of gas flow (these may for example be ducts to which an oscillating movement is given to cause an alternating displacement of the
20 sheet from one edge of the conveyor to the other).

To distribute the particles within the width of the mat, arrangements may be adopted which are of the same type as those used for the newly formed fibres. This would however call for a not inconsiderable increase in complexity of the apparatus
25 within a relatively restricted space. For these reasons, it is usual to make do with solutions which are less elaborate but also less readily controllable such as the use of deflecto walls which "even out" over the fullwidth of the conveyor the gaseous current which carries the particles.

W

In the best of the prior art cases, deficiencies in distribution are minimised but are never completely mastered. A particular consequence of this is that of limiting the total content of particles which can be so introduced into the make-up of mineral fibre mats.

Economically speaking, it is therefore desirable to have available techniques which make it possible to achieve a satisfactory distribution of fibre particles added to the newly formed fibres in order to increase the quantity of these recovered particles which are used in the composition of the mats, and this without adversely affecting the essential qualities of these mats. This is the object of the invention.

According to the invention and in contrast to the traditional techniques of introduction of fibre particles, the particles in question are directed in such a way that they penetrate into the annular fibre sheet between the centrifuge and a zone downstream of the centrifuge where the sheet narrows.

It is known that the conditions in which the fibre sheet develops beyond the centrifuge play a very important part in the quality of the mat prepared. Particularly, as far as possible, every effort is conventionally made to avoid any upset in the flow of gases carrying the fibres, particularly in order as far as possible to limit the formation of roves which interfere with the homogeneity of fibre distribution throughout the mat. Surprisingly, the inventors have found that the penetration of particles carried by a current of gas into the annular sheet and in proximity of the centrifuge does not bring about any substantial changes as regards the appearance of interfering roves and permits a very homogeneous

(M)

distribution of particles in the newly formed fibres.

Observation of gaseous flows at the level of penetration of the particles into the annular sheet can in part explain the results found. Indeed, when penetration into the sheet occurs sufficiently closely to the centrifuge and under conditions of velocity which will be referred to hereinafter, a spreading-out of the current carrying the particles is observed.

Without studying in detail the mechanics which produce this "spreading-out" and hence a satisfactory dispersion of particles in the gaseous flow carrying the fibres, it is possible to recall that the zone located under the centrifuge is subject not only to the action of gaseous currents passing along the centrifuge but also to currents induced by them.

Immediately under the centrifuge, a zone is established which is at negative pressure in relation to ambient atmosphere, tending to narrow the sheet of fibres. Beyond this zone, the current which is initially of annular form but which reforms is propagated according to a conical configuration.

20

In this way, the particles introduced are entrained in movements of gas which result in the formation of the narrowed flow and the result is a good dispersion of these particles.

25

Introduction too far downstream of the narrowing zone would not allow distribution of particles throughout the whole of the current carrying the fibres. Similarly, a minimum of distance from the centrifuge must be respected in order not to upset the flow of drawing currents at the level where the



product is drawn. This latter distance may nevertheless be relatively small. In the ordinary way, it may be considered that beyond 150 mm downstream of the centrifuge, the fibres formed are stabilised and that penetration of the current carrying the particles does not interfere with the drawing conditions.

To facilitate penetration, the flow of gases carrying the particles is directed transversely to the gaseous drawing current.

A certain inclination in respect of the general direction of flow, that is to say in relation to the vertical, is possible subject to this inclination nevertheless leading to penetration of the current carrying the particles into the annular fibre sheet.

Furthermore, the inclined jet must penetrate into the fibre sheet without striking those elements of the apparatus which are ordinarily situated at the level of narrowing of the sheet, particularly the binder spraying means.

Taking these conditions into account, the jet carrying the particles should subtend an angle of at least 30° and preferably at least 45° to the vertical.

The direction of the current carrying the particles is furthermore advantageously situated in a vertical plane containing the direction in which extends the production line and therefore the conveyor. A different direction (even if, as we shall see, the energy developed by the current carrying the particles is relatively low in relation to that of the drawing

current) could result in a deviation of the current carrying the fibres in a transverse direction in relation to the conveyor and hence alter the distribution. By directing the particle carrying current in a longitudinal plane in relation to the conveyor, even if the current carrying the fibres is slightly diverted, this has no effect on the transverse distribution.

preferably the content of additional fibrous particles in the mat is equal to or greater than 10%.

24

The invention is explained in greater detail in the ensuing description in which reference is made to the accompanying sheets of drawings in which:

Fig. 1 diagrammatically shows part of the mineral fibre mat production line in which the fibres are produced and collected together; in this drawing, the means of introducing the fibres are of conventional type;

Fig. 2 shows an embodiment according to the invention for the introduction of particles;

Fig. 3a shows in section the faulty manner of distribution of particles observed in prior art introduction methods;

Fig. 3b is a view similar to that in Fig. 3a but for a product prepared by introducing the particles in accordance with the conditions of the invention.

Fig. 1 shows three centrifuges 1, 2, 3 for fibre production and forming part of one and the same line. These centrifuges are aligned at the top of a substantially enclosed receiving chamber 4. They are situated above a conveyor 5 which constitutes the bottom part of the receiving chamber. The conveyor 5 is permeable to gases.

According to the dimensions of the chamber 4, so one or more compartments 6 are disposed immediately under the

25

conveyor. Vacuum applied by means not shown maintains the compartment 6 at negative pressure in relation to the atmosphere in the chamber 4. Under the effect of this negative pressure, the gases carrying the fibres pass through the conveyor 5 and are evacuated while the fibres are retained on the conveyor 5.

Each of the centrifuges 1, 2, 3 produces a fibre sheet 7 of annular form which is entrained by the drawing gases towards the receiving conveyor. After a narrowing at 8, the flow of fibres spreads out in a conical shape.

Fig. 1 does not respect the proportions of the various elements but seeks to show as representatively as possible the path followed by the fibres from the centrifuge to the conveyor.

For reasons of economy and bulk, the various centrifuges are situated as closely as possible to one another so that in practice and as shown in Fig. 1 the different flows of fibres emanating from neighbouring centrifuges have a tendency to blend with one another before reaching the conveyor.

Not shown in this drawing are the various means which are normally situated along the path of the fibres such as the jets for spraying water and binder and possibly the means intended to improve transverse distribution of the fibres over the conveyor. Such means are normally situated downstream or at the level of the zone 8 in which the fibre sheet is narrowed.

Fig. 1 shows three centrifuges. In the case of major industrial lines, the number of centrifuges may be far higher and be up to 10 or even 12. As we will see hereinafter, the invention is applicable whatever number of centrifuges may be

26
employed and even if there is only one centrifuge, while conventional means of introducing particles necessarily entail the use of a plurality of centrifuges.

5 The fibres are retained on the conveyor 5 where they are deposited by becoming entangled with one another. The thickness of fibres on the conveyor increases from one end to the other of the line by successive accumulation of fibres emanating from the various centrifuges. Upon emerging from the receiving chamber 4, the collected-together layer 9 of fibres
10 undergoes various treatments to produce the final felt. In particular, a heat treatment is carried out to polymerise the binder composition with which the fibres have been coated and in order to fix the structure of the felt. Likewise, the continuous belt of felt is brought to the required dimensions.

15 Thus, conventionally, the selvages are cut off, as was stated earlier, and after undergoing threading, the selvages are recycled directly into the receiving chamber in the form of particles or nodules.

In order to convey them from the point where they are
20 formed to the receiving chamber 4, the particles are entrained by a flow of gases.

Traditionally, particles are introduced into the receiving chamber between two centrifuges. The ducts 10, 11 carrying the gaseous flow which is charged with particles discharge these latter substantially in the direction of propagation of the flows of newly produced fibres.
25

If applicable, as we have indicated, a deflector situated in the path of the gaseous current carrying particles deforms this current in such a way as to disperse the particles

over the full width of the conveyor. Such an arrangement is not shown in Fig. 1.

As will be readily appreciated, a perfect distribution of particles within the layer of fibres 9 gathered together on the conveyor would entail there being a perfectly homogeneous mixture of flows of newly produced fibres and gaseous current carrying particles. If a certain mixture is carried out effectively prior to these fibres and particles becoming deposited on the conveyor, then in practice this mixture is not generally sufficient to produce a completely homogeneous product.

When the line is limited to three centrifuges and two particle introduction points, the result of this conventional arrangement is of the type shown diagrammatically in Fig. 3a. The cross-section through a felt shows in its thickness a succession of different layers. In particular, the particles (shown as darker for the requirements of the drawing) are to be found in a substantially higher proportion in two intermediate layers 12 and 13.

Without arriving at a complete separation of the layers from one another, distribution is therefore not homogeneous, which in particular and in this case results in limiting the quantity of particles which can be introduced for the particle content not to exceed a certain threshold at any point in the felt.

It must be pointed out that although the use of appropriate means such as deflectors makes it possible to achieve a satisfactory transverse distribution of particles, such means cannot in any way improve the distribution through the thickness of the mat. This distribution indeed results, as will be



readily appreciated, from a lack of uniformity in the fibre/
particle mixture in the direction of progress of the conveyor.
A zone in which the deposited material consists essentially of
newly formed fibres (that which is at a right-angle to the
5 centrifuge) is followed by a zone where the particles are rela-
tively abundant (at a right-angle to the first point of
particle introduction) and this is followed by a new zone in
which particles are in a very small percentage and so on.

The solution according to the invention for obtaining
10 a satisfactory distribution is illustrated in Fig. 2.

In this drawing, the fibre forming device is shown in
greater detail than in Fig. 1. In the main, it comprises a
motor assembly shown diagrammatically at 14 which, through the
medium of belts, produces rotation of a hollow shaft 15. The
15 centrifugal apparatus 16 is mounted at the end of this hollow
shaft 15 and it is formed by a drum the peripheral wall of
which comprises multiple orifices.

The molten mineral material is conveyed perpendicularly
to the axis of the shaft 15. It flows from a spinneret inside
20 the centrifuge 16. The material collected by a basket situa-
ted in the axis of the shaft 15 is sent from the basket over
the peripheral wall of the centrifuge and escapes through
orifices in this wall, appearing in the form of filaments.

To maintain the centrifuge and the material under ade-
25 quate temperature conditions for the formation of fibres, it
has been customary to use various means. For example, it is
advantageous to heat the centrifuge (or at least the bottom
part of it which is exposed to more rapid cooling due to its
contact with the surrounding air) by induction. An induction

ring is shown at 17 in Fig. 2.

The filaments thrown out of the centrifuge are entrained by an annular gas flow. This gas flow is preferably at a high temperature. In particular, it may be a flow of combustion gases issuing from an annular burner 18.

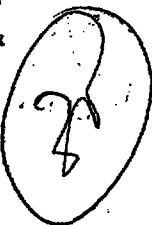
5 With apparatus of this type, it is likewise customary to employ supplementary gaseous jets enveloping the drawing gas flow. These jets may for example be emitted by a crown 19 to which pressurised gas is supplied and which has a series of orifices for directing jets essentially in the direction of
10 progression of the drawing gases.

The fibres formed and entrained by the drawing gases form a sheet 20, the characteristics of which have been stipulated hereinabove.

The gaseous current currying the fibres as it proceeds
15 towards the receiving means is then more often than not cooled by water being sprayed over it by jets 21 disposed in a circle around the gaseous current. The jets are sufficiently numerous and close enough together to produce an homogeneous treatment of the fibres.

20 In the same way, jets 22 disposed around the current carrying the fibres spray a binder onto the fibres in order subsequently to achieve satisfactory cohesion of the fibres which are mixed together in the constituted mass.

On this point, it should be noted that in conventional
25 methods of fibre particle introduction, the latter are not directly subjected to this spraying with binder. For this reason, cohesion of these particles to the newly formed fibres is brought about less satisfactorily within the mat.

 This is a factor which may adversely affect in particular the mechanical properties of the finished mat. In particular the level of compression applicable to such mats without compromising their resumption of thickness afterwards may diminish in the presence of these particles which are less satisfactorily "bonded" to the mass of fibres.

Where the technique according to the invention is concerned, introduction of particles is carried out advantageously between the level of narrowing of the sheet and the centrifuge as represented in Fig. 2. Such introduction is advantageously localised upstream of the point at which the binder is sprayed on, so that the fibre particles also undergo a coating to encourage cohesion with the new fibres.

The particles carried by a gaseous current are conveyed to the vicinity of the sheet of fibres by means of ducting 23, of which only the end is shown in Fig. 2.

The ducting 23 directs the gaseous stream carrying the particles transversely to the trajectory of the sheet of fibres.

The respective characteristics (velocity, volume or rather impulsion) of the drawing gas currents carrying the fibres and the current carrying the particles are chosen so that the latter penetrates into the former.

Penetration of the current carrying the particles into the drawing current is accompanied by a kind of "widening-out" which brings about projection of particles into the whole of the fibre carrying current. The mechanics which produce this dispersion have not been perfectly elucidated but it will be appreciated that the zone in question being a site of considerable turbulence, penetration of the gaseous current carrying

32

the particles can only accentuate such turbulence and favour the combination of these two currents and dispersion of particles within these combined gaseous currents.

As a general rule, the gaseous current used to carry the particles must be at a certain velocity in order to avoid "blockages" forming in the ducting. Indeed, the path travelled by the particles is often relatively long and passes through a certain number of directional changes, all factors which may lead to irregular functioning if the entrainment of the particles is not sufficiently vigorous.

As an indication, the distance over which the particles are carried may be more than 100 m. This is the case in particular with those formed from the selvages, the selvedge cutting, shredding and recycling to the receiving chamber being operations which are then carried out continuously at the end of the production line which normally extends over a considerable length.

The velocity of the gases making it possible to foresee blockages or sedimentation of particles for traditional particle sizes of around 10 to 20 mm, will be ideally between 15 and 30 m/s and will preferably be between 20 and 25 m/s.

For combination of the gaseous currents to be carried out in a satisfactory manner, that is to say for the current carrying the particles to penetrate properly into the current carrying the fibres without going so far as to traverse it completely, it is advantageous to work with a ratio of impulsion of the particle current I_p to the fibre current I_f of between 1/30 and 1/5 and preferably at a ratio around 1/10.

The impulsion of the gaseous current is defined by the expression:

$$I = \rho . V^2 . S$$

in which:

- ρ is the volumetric mass of the gas (in k/cu.m)
- 5 - V is the velocity of the gas (in m/s)
- S is the cross-section (in sq.m).

The dimensions of the ducting 23 carrying the particles are determined by practical considerations. It is necessary for the cross-section of this ducting to be adequate to allow
10 particles to pass through without difficulties. By way of indication, for particles of an average size of around 15 to 20 mm and for a velocity of around 20 m/s, a cross-section of approx. 80 mm diameter is suitable.

A smaller diameter may be envisaged but increases the
15 risks of blockage except if the velocity of the gaseous current is increased. Likewise, a larger diameter may be used but will result in a far larger quantity of air being blown through in order to maintain the velocity conditions required in order suitably to convey the particles. This second case leads to a
20 much higher energy cost without any improvement in the technology. Furthermore, too great a mass of gas in relation to that which is carrying the new fibres may upset the balance of the respective impulsions such as has been defined hereinabove.

It can be noted that for a diameter of approx. 80 mm,
25 the volume of gas carrying the particles is very much greater than that which is strictly necessary for this form of air transport.

Under conditions corresponding to the introduction of high particle content, this is equivalent to a loading of

around 0.25 kg of particles per cu.m of blown air which remains a very small quantity.

If we leave on one side the questions of dimensions needed for the ducting, such transport by air flow may in fact
5 entrain without problem very much higher loadings of the order of 1 kg/cu.m or more.

By way of example of embodiment of the invention, the introduction of fibre particles has been carried out as previously indicated on a production line equipped with fibre
10 making machines such as those shown in Fig. 2.

The output from each centrifuge is 20 tonnes of glass fibres per day. The insulating product prepared consists of very fine fibres (micronaire fineness 3.0 under 5 g).

From experience, it is evident that the sensitivity of
15 the properties of mats to the introduction of particles is the greater the finer are the fibres. The choice made therefore was to carry out these tests on those of the products for which the introduction of particles is the most tricky in order to have fully significant results.

20 The product is first prepared under conventional conditions, that is to say recycling the crushed selvages representing under the best working conditions a maximum of 4% of the mass of the mat formed. In this first test, reintroduction of particles is carried out between the centrifuges as shown
25 in Fig. 1.

The mat of fibres produced exhibits a surface mass of 850 g/sq.m, a volumetric mass of 9.48 kg/cu.m and a thickness of 140 mm prior to compression and storage.

The mat is rolled onto itself with a compression rate

of 4:1, in other words in its compressed form its thickness is no longer any more than about 35 mm. The resumption of thickness is measured after 60 days' storage under these conditions of compression.

5 Still within the traditional methods of fibre particle introduction, when the level of particles is increased by adding crushed products originating from other sources, and if all other conditions remain identical, a substantial loss is noted in the resumption of thickness after storage which bears
10 witness to a far lower resistance to compression (and to far less elasticity).

By way of indication, for a total content of re-introduced particles (crushed selvages and particles from other sources) of around 10% of the mass of the mat, the loss
15 in thickness in comparison with the product in which only the selvages are recycled may be as much as 7 to 8%. This loss attains 12% for a particles content of 14%.

Observation of products shows a very non-homogeneous distribution of the particles through the thickness, resembling
20 that shown in Fig. 3a.

Of course, this poor distribution is all the more substantial in properties of the mat if these particles are in greater proportion. Comparison drawn up between a mat consisting solely of newly formed fibres and a mat in which the
25 crushed selvages are reintroduced (for a total content representing 4% of the mass) show that the properties are not appreciably altered. In particular, the thickness resumption capacity is not substantially affected.

The tests carried out under the conditions of the

invention for different contents of particles produce a product in which the distribution of particles in the thickness is virtually uniform as indicated in Fig. 3b.

In Figs. 3a and 3b, the particles 24 have been shown in such a way as to allow visualisation of distribution. In fact, when the fibre particles introduced emanate from a prior similar production, whether from selvages or products not complying with the standards, the distinction between the mass of fibres and the particles is virtually no longer apparent. It can only be found from attentive examination of the fibre structure. Possibly the fact that the fibres used in the constitution of these particles have already received a first coating of binder may lead to a slight shading of colour (when the binder has a tendency to colour the fibre, of course).

Improvement in the distribution of particles is within the capacity to regain thickness, particularly for high levels of content. Thus, in contrast to what was found with the conventional particle introduction method, the resumption of thickness is for practical purposes unaffected for levels attaining or exceeding 10% of the mass of the mat.

For mats of very fine fibres (micronaire finess 3.0 under 5 g), the introduction of 4% of particles corresponding to selvages and 7% of particles of other origin but of the same type is reflected in a slightly less satisfactory resumption of thickness (approx. 4%).

This slightly reduced resumption of thickness is less or virtually not at all substantial when mats are prepared from fibres which are a little less fine (micronaire fineness 3.5 under 5 g, for example, or better still 4.0 under 5 g) and

36
which correspond to the products most widely used in conventional heat insulation applications. Thus, for these products the content of particles may be as much as or more than 15%.

Taking these results into account, it would appear that,
5 thanks to the invention, it is possible to obtain mineral fibre mats which contain increased proportions of particles without adversely affecting the properties of the mat while retaining satisfactory properties. Furthermore, since the products concerned are essentially intended for heat insulation, it is
10 important to note that the introduction of particles according to the invention, even for a content which may amount to 15%, will have virtually no influence on the thermal conductivity of the mats produced.

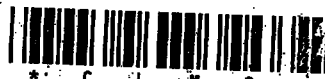


37

PATENT CLAIMS

1. A method of producing mats of mineral fibres comprising the formation of fibres from a molten material which is passed into a centrifuge, the periphery of which is provided with orifices, the material passing
5 through these orifices being projected out of the centrifuge in the form of filaments, a first gaseous current flowing over the periphery of the centrifuge entraining the filaments and completing the drawing thereof, this current which is initially of annular form
10 narrows downstream of the centrifuge and subsequently broadens to form a current of substantially conical shape, the fibres entrained by said first gaseous current being directed towards a receiving conveyor where they are collected, a binder composition including
15 fibrous particles being sprayed onto the fibres during the course of their travel between the centrifuge and the conveyor and in which the fibrous particles are likewise caused to become deposited on the conveyor with the newly formed fibres with which they homogene-
20 ously blend, the fibrous particles being carried by a unidimensional second gaseous current directed transversely of the direction of progress of the first gaseous current, said second current penetrating the first current at a point situated between the centrifuge and the zone
25 in which the first current narrows, and the second current following a direction which subtends an angle

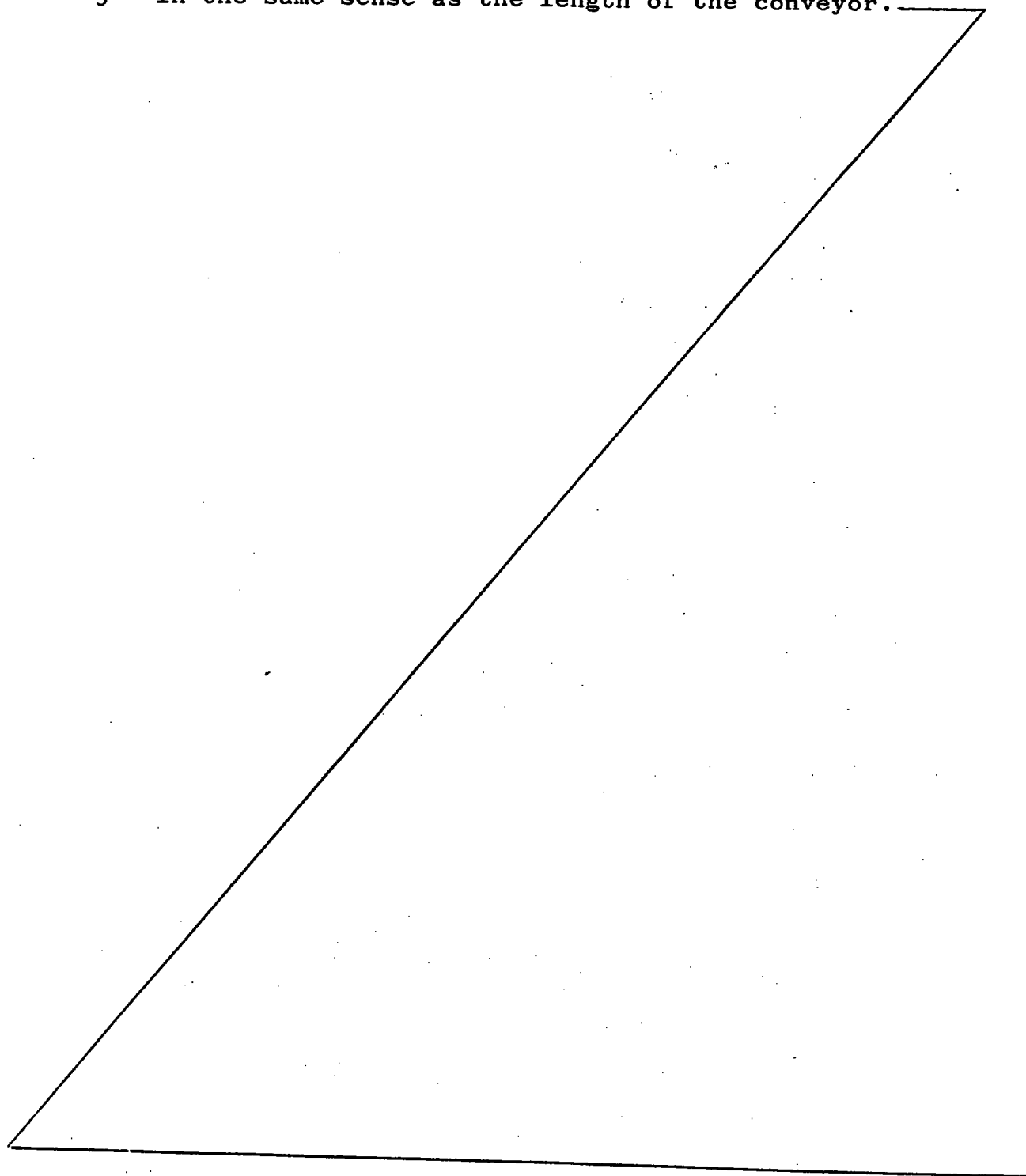
38



-22

of at least 30° to the general direction of progress of the first current.

2. A method according to Claim 1 in which the gaseous current carrying the particles is directed
- 5 in the same sense as the length of the conveyor.



3. A method according to one of the preceding Claims, characterised in that the velocity of the gaseous current carrying the particles is between 15 and 20 m/s.

4. A method according to one of the preceding Claims, wherein the ratio of impulsions of the gaseous current carrying the particles and that carrying the fibres I_p/I_f is comprised between 1:30 and 1:5.

5. A method according to Claim 4 in which the ratio $I_p:I_f$ is in the vicinity of 1:10.

10 6. A method according to one of the preceding Claims in which the penetration of particles into the current carrying the fibres is carried out upstream of the zone in which the fibres are coated with the binder composition.

7. A method according to any one of the preceding
15 Claims in which the recycled fibre particles originate in part from the shredded selvages of mats formed on the production line.

8. A method according to any one of the preceding
Claims in which the content of additional fibrous particles in
20 the mats produced is equal to or greater than 10%.

9. Mat of fibres obtained by the method according to any one of the preceding Claims.

