

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 89113724.2

51 Int. Cl.4: **B08B 3/04**

22 Date of filing: 25.07.89

30 Priority: 01.08.88 IT 8365488

43 Date of publication of application:
07.02.90 Bulletin 90/06

84 Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

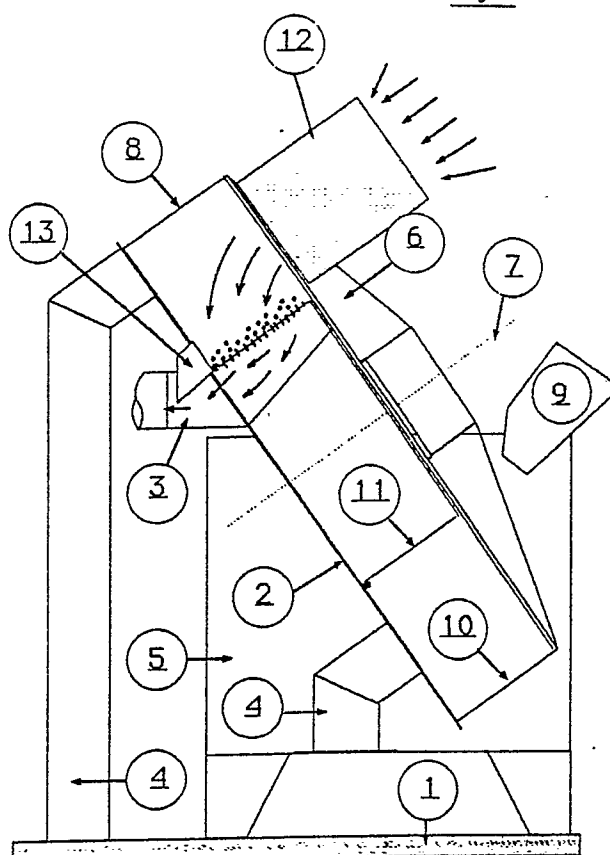
71 Applicant: **RENI CIRILLO S.r.l.**
61, Via Garibaldi
I-20061 Carugate (Milan)(IT)

72 Inventor: **Reni, Mario**
c/o REINI CIRILLO S.r.l. Via Garibaldi, 61
I20061 Carugate MI(IT)

54 **Machine for the washing and the drying of metal pieces.**

57 A machine is described for the washing and the drying of metal pieces consisting of a metal disk turning around a support which keeps it inclined from 15 to 45 degrees in respect of the vertical; the central part of said disk consisting of a cylindrical drum while the outer, coaxial ring is divided into sectors separated by radial partitions; during the rotatory movement of the disk, the lowest sector is plunged into a tank containing a washing liquid while the highest one comes to be connected with a hot air system which allows the pieces contained in the said sector to be dried.

Fig 1



Machine for the washing and the drying of metal pieces

The present invention relates to a machine for the washing and drying of metal pieces consisting of a metal disk turning around a support which keeps it inclined from 15 to 45 degrees in respect of the vertical; the central part of said disk consisting of a cylindrical drum while the outer, coaxial ring is divided into sections separated by radial partitions; during the rotatory movement of the disk, the lowest sector is plunged into a tank containing a washing liquid while the highest one comes to be connected with a hot air system which allows the pieces contained in the said sector to be dried.

In the mechanical industry, particularly in that part which is concerned with the production of mechanical small parts, the problem of cleaning, degreasing, pickling and other similar processes constantly presents itself after the forming process of the parts.

The aggregate of the above mentioned processes, commonly assuming the name of "finishing", is ever more frequently effected with machines, particularly with vibrating machines, which give excellent surface finishes in a simple and automatic fashion.

Normally, the finishing processes are effected by using water solutions and/or suspensions of various chemical compounds with detergent, pickling, abrasive or colouring action and they must, therefore, always be completed with a washing and drying cycle of the finished pieces. The washing cycle, carried out with a liquid, which normally is water with the possible addition of a dewatering agent which make water flow more easily on the wet surfaces of the pieces, must always be followed by a drying cycle of the washed pieces before these are packed for despatch or submitted to subsequent terminal processes such as painting or punching. The water, in fact, tends to adhere to the surface of the metal pieces in the form of small drops which may leave calcareous residue (if normal water is used for the final wash) or stains, but in any case the drops favour surface oxidation of the pieces if these are made from metals or from alloys subject to oxidation.

Among the many possible systems of drying metal pieces, the one that has asserted itself, particularly in the field of metal small parts, is the system which uses solid absorbing material, broken down into small particles, such as wood sawdust or other synthetic and natural materials. These materials have the power to absorb a great quantity of water in proportion to their own weight and, furthermore, they exercise a very slight abrasive action on the surface of the pieces processed,

without altering their finish but, on the contrary, improving their polish.

One of the problems connected with the driers using absorbing material is represented by the fact that the absorbing material is likely to get stuck into the small holes and the grooves of the pieces.

This problem becomes serious in the case of small metal pieces having internal cavities, such as small-scale models of cars, air planes or boats which are produced by die-casting and have a wide diffusion as toys for children. It is so difficult to remove the absorbing material from the internal holes of these pieces, that the use of driers working without any absorbing material is generally preferred.

The applicant has already described some machines for the drying of small metal pieces: such as e.g. by using absorbing material and hot air in Italian Patent Application No. 19729 A/87.

The perfect drying of pieces having internal cavities, small holes or grooves is a problem which has not been solved even by the usual hot air driers because the small water drops which remain into said cavities are split into other smaller drops by the action of air which is blown against the pieces.

Another problem which has to be faced when drying pieces having internal holes is represented by the fact that at least some of the pieces have cavities get filled with water which can be drained only by turning the pieces over. Therefore, if pieces are processed into baskets which move without causing the contained pieces to be turned over, some of them will not be completely dried even when processed by a hot air machine and are entraining an amount of water which greatly hinders the subsequent finishing treatments of the pieces, particularly if they must be undergo painting operations.

It has not been found that it is possible to wash and to dry the metal pieces by the machine according to the present invention which beside having the advantage of performing both the operations also avoids all the drying problems connected with metal pieces in general including the small ones having grooves, internal cavities and holes.

According to one of its fundamental features, the machine according to the present invention consists of:

(a) a metal disk fixed to a support which keeps it inclined from 15 to 45 degrees in respect of the vertical,

(b) a coaxial cylindrical drum fixed to said disk and having a smaller diameter in respect of

said disk; the upper section of said drum, adjoining the hot air supply area, consisting of a grate,

(c) a rim, rotating around the drum, and coaxial with both the fixed metal disk and the drum, divided into sectors separated by radial partitions,

(d) a horizontal tank containing the washing liquid in which the lowest sector of the rotating rim is permanently plunged,

(e) a heating system for the air which is blown into the highest section of the rotating rim and is subsequently suctioned through a duct connected with a hole made in the upper part of the fixed disk in correspondence with said section,

(f) a loading chute for metal pieces to be washed into the lowest sector of the rotating rim,

(h) an unloading chute for conveying dry pieces out of the machine; said chute being connected with a hole made in the upper part of the fixed disk at least one sector away from the hole of the air suction.

The rim rotating around the central drum is endowed with either continuous or intermittent motion according to the type and the quantity of the pieces fed into the rim sectors.

Under normal conditions, the rim makes from 20 to 60 rounds per hour.

According to a typical embodiment, the number of sectors of the rim is between 6 and 18.

The division of the rim into sectors separated by partitions makes it possible to wash and dry even big-size or heavy pieces which are loaded one by one into the rim sectors. In this way every single piece has very little play inside its sector and does not come into contact but to the partitions and the fixed disk only.

The direct contact between the pieces and the possible resulting damages due to their size and weight are thoroughly eliminated.

A further advantage of the machine of the present invention is that the motion of the rotating rim causes the pieces contained in the sectors to be moved, each of said sectors performing a rotational movement over the 180 degrees. Said rotation causes the pieces either to be turned over or to roll one on the other, according to the number of pieces contained in each sector, and thus promoting the draining of the liquid which is possibly present in the turned upwards cavities of the pieces.

The particular inclination of the disk make certain the liquid to be drained and allows its recovering into the tank during the progress of the rim sectors from the exit from the tank and the injection of the hot air, without having the upper pieces dripping on the lower ones, which would certainly occur if the disk was fitted in a vertical position.

The hot air which is blown above the pieces

and then suctioned below them through the grate of the cylindrical drum, creates a slight depression into the cavities, holes and groves of the pieces. Such depression helps the evaporation of even the smallest residual drops of the washing liquid.

In case said liquid does not consist of water but of a compound which cannot be dispersed in the atmosphere, the suctioning of the air coming from the drying of the pieces through the above mentioned duct allows said air to be easily conveyed towards waste or recovery systems of the evaporated liquid.

Furthermore, the inclination of the fixed disk allows pieces to be unloaded when the sector containing them reaches the proper hole of the fixed disk.

Pieces are unloaded by gravity without falling or knocking against each other, which might damage their surfaces and compromise the finish obtained through the previous treatment.

Typically the angle between the pieces unloading hole and the hot air suction hole is comprised between 20 and 60 degrees.

A typical embodiment of the present invention will now be described by referring to the attached drawing in which: - figure 1 shows a vertical section of the machine.

A metal disk 2 is fixed to the basement 1 by means of supports 4 with an inclination of 30 degrees in respect of the vertical. The rotatory part of the machine is mounted on the fixed disk 2 by means of ball bearings, which consists of a rim 10 rotating around a cylindrical drum 11 fixed to the metal disk 2. Rim 10 is divided into twelve sectors having the same size and separated by radial partitions (not shown in the figure). The upper section of drum 11, adjoining the hot air supply area from the heating system 12, consist of a grate which allows the passage of the air and of the liquid but holds back the pieces.

The lower part of the disk 2 is plunged in a tank 5 containing the washing liquid. The level of said liquid is kept at a height such as to completely cover the lowest sector of the rim 10.

The upper part of the disk 2 is provided with an opening connected with a chute 13 for the unloading of the metal pieces contained into the sector of rim which happens to reach that position. The grate of the central drum which enables the passage of the hot air flow is situated 30 degrees far from the pieces unloading chute and is connected with suction duct 3 for the air fed to the machine through the heating system 12.

Pieces to be washed are fed to the machine through the chute 9 and fill the sector of the rim 10 plunged into tank 5. Rim 10 rotates around its axis 7 driven by a motor (not shown in the figure) and, as a result of the rotation, the lowest sector is

progressively moved upward with its content of pieces. The following sector will now come to be situated in the lowest position and thus be loaded by other pieces fed to the machine and so on. Owing to the rotation of the rim 10, the sector charged with pieces will emerge from the washing liquid and said liquid will flow back into tank 5 by passing through the interstices existing between the fixed disk, the central drum and the radial partitions.

During the movement of the sectors from the lowest part to the highest one of the fixed disk 2 (equal to 180 degrees), the pieces contained into the sectors will change their position allowing any liquid assembly retained into their upwards cavities to flow out.

In the upper part of the machine the supporting wall of the heating system 12 forms an enclosed chamber with sector 8 which is situated in the highest position of the fixed disk 2 and is connected with the grate of the central drum 11 and with air duct 3. The hot air is fed into sector 8 to dry the pieces.

The hot air is suctioned by a fan (not shown in the figure) which is connected with duct 3. The fed air is coming from the heating system 12.

Therefore the sector 8 forms a quasi-enclosed area which, owing to the suction exerted through the duct 3, happens to be an area of slight depression which favours the elimination of the liquid or of the residual humidity of the pieces contained in said sector. By continuing the rotation, the sector with the dry pieces will then reach the hole of the disk and chute 13 through which the dry pieces will be conveyed out of the machine.

Claims

1. Machine for the washing and the drying of metal pieces, consisting of:

(a) a metal disk fixed to a support which keeps it in an inclined position in respect of the vertical,

(b) a coaxial cylindrical drum fixed to said disk and having a smaller diameter in respect of said disk; the upper section of said drum, adjoining the hot air supply area, consisting of a grate,

(c) a rim, rotating around the drum, the coaxial with both the fixed metal disk and the drum, divided into sectors separated by radial partitions,

(d) a horizontal tank containing the washing liquid in which the lowest sector of the rotating rim is permanently plunged,

(e) a heating system for the air which is blown into the highest sector of the rotating rim and is subsequently suctioned through a duct connected with a hole made in the upper part of the

fixed disk in correspondence with said sector,

(f) a loading chute for metal pieces to be washed into the lowest sector of the rotating rim,

(h) an unloading chute for conveying dry pieces out of the machine; said chute being connected with a hole made in the upper part of the fixed disk at least one sector away from the hole of the air suction.

2. Machine for the washing and the drying of metal pieces as per claim 1. characterized by the fact that the inclination of said metal disk in respect of the vertical is from 15 to 45 degrees.

3. Machine for the washing and the drying of metal pieces as per claim 1. characterized by the fact that the rim rotating around the central drum is endowed with either continuous or intermittent motion and makes from 20 to 60 rounds per hour.

4. Machine for the washing and the drying of metal pieces as per claim 1. characterized by the fact that the number of sectors of the rim is between 6 and 18.

5. Machine for the washing and the drying of metal pieces as per claim 1. characterized by the fact that the angle between the pieces unloading hole and the hot air suction hole is comprised between 20 and 60 degrees.

6. Machine for the washing and the drying of metal pieces as per claim 1. characterized by the fact that the hot air is blown into the machine above the pieces and is suctioned out of the machine below them.

Fig. 1

