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Applicant: **ERVIN INDUSTRIES INC, 3893 Research Park
Drive, Ann Arbor Michigan 48104 (US)**

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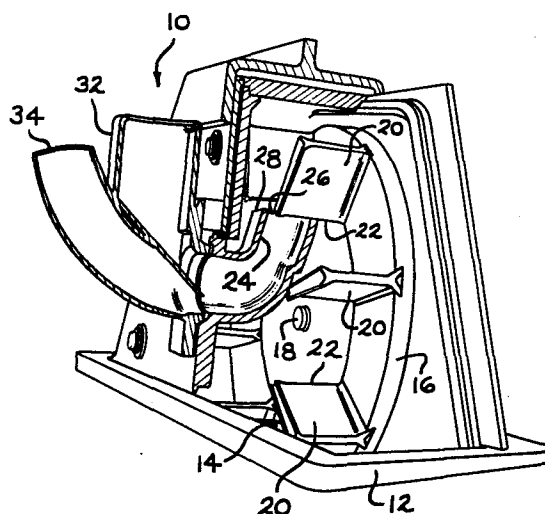
Inventor: **Poltz, John Turner, 680 Eastlook Drive, Saline
Michigan 48176 (US)**

Designated Contracting States: **DE FR GB IT**

Representative: **Williams, Trevor John et al, J.A. KEMP &
CO. 14 South Square Gray's Inn, London WC1R 5EU (GB)**

Method and apparatus for de-finning metal castings.

A method of and apparatus for removing fins and other excess metal from metal castings in which the centrifugal force of a rotating member (16) propels impact pellets toward the casting. The mass of the moving pellets striking the fins must be sufficient to knock the fins off the casting and as a result the pellets must be of a large size. A plurality of radially extending blades (20) are mounted on the rotating member (16) and have inner ends (22) which terminate at positions spaced radially from the axis of rotation (18) of the rotating member. A supply conduit (24) extends into the space between the axis of rotation and the inner ends of the blades, and terminates at a distance from the path of the blade which is slightly greater than the largest diameter of the impact pellets. Impact pellets are fed into the conduit, whereupon air is introduced into the conduit at a force sufficient to pre-accelerate the pellets through the conduit and onto the inner ends of the blades.



EP 0 095 829 A1

METHOD AND APPARATUS FOR DE-FINNING METAL CASTINGS

1 BACKGROUND OF THE INVENTION

In the casting of metal objects, the objects tend to emerge from the molds with undesirable excess material attached. For example, sand from the mold may
5 cling to the object after removal. Rough edges may form around openings and projections. Perhaps the biggest problem, especially in the casting of large objects with thick walls, is the appearance of "fins" or excess metal in the form of projections. Fins are most likely to form
10 at the mold parting lines and at areas where cores are set in the mold. These fins may have substantial thickness and may cover a substantial area.

Some of the excess material can be removed by exposing the molded part to a centrifugal blasting machine
15 in which an impeller throws shot against the part. These machines are generally satisfactory in removing many types of materials from the cast object and in cleaning the object. However, these machines have not been effective in removing fins. The force produced by conventional
20 size shot at practicable impeller speeds is insufficient to remove the fins.

The force with which a particular piece of shot strikes a fin is a function of the mass of the shot and the impeller speed. Impeller speeds cannot be
25 increased significantly without risk of pitting the surface of the casting. In fact, it would be desirable to reduce the impeller speed. Increasing the size of the shot has heretofore been impracticable as well. The largest shot size recognized by The Society of Automotive
30 Engineers, is SAE-S1320 (ninety percent must be retained on a screen having .1320 inch diameter openings and 100 percent must pass through a .187 inch diameter opening).

(2)

1 Typically, the largest shot used in centrifugal blast
machines is about one-sixteenth inch; this shot is too
small to remove fins. Even the largest SAE standard
size (S-1320) produces too small a force. Furthermore,
5 conventional blasting machines have not been readily
adaptable to large size shot which can bind conventional
impeller mechanisms because of insufficient clearance
between the feed mechanism and the impeller blades.

It is an object of the present invention,
10 therefore, to provide a method and apparatus for removing
fins and other excess material from metal castings. In
particular, it is an object of this invention to provide
a method and apparatus for propelling particles of a
sufficient size to accomplish the de-finishing process.

15 SUMMARY OF THE INVENTION

According to this invention, a rotating member
is provided with a plurality of radially extending blades.
The rotating member is aligned so that its axis of rotation
is perpendicular to the line between the member and the
20 casting to be de-finned. A plurality of impact particles
are fed onto the inner ends of the blades, so that the
centrifugal force of the rotating member causes the impact
particles to move outwardly on the blades and to be
subsequently propelled toward the casting. This process
25 of removing fins and other excess material by centrifugal
propulsion of particulate matter is unique in the field.

The invention also provides a machine that is
capable of centrifugally propelling particles of sufficient
size to accomplish the de-finishing process. The machine
30 consists of a rotatably supported member on which a plurality
of radially extending blades are mounted. The blades have
inner ends which terminate at positions spaced a uniform
and predetermined distance from the axis of rotation of the
rotating member. A particle supply conduit is also provided

(3)

1 which extends into the space between the axis of rotation
and the inner ends of the blades and terminates in a
closely spaced relation with the blades. A plurality
of impact pellets are contained on the machine in a
5 feed spout which communicates with the supply conduit.
A forced air source also communicates with the supply
conduit and operates to force the impact pellets through
the conduit and onto the inner ends of the blades. Rota-
tion of the rotating member causes the impact pellets to
10 fly off the blades in a discernable pattern and impact
against a casting. The distance between the terminal
end of the supply conduit path and the inner ends of
the blades is greater than the largest diameter of the
impact pellets, so that the flow of pellets onto the
15 blades does not interfere with blade movement. The machine
is thus adaptable to impact pellets of sizes which exceed
the maximum standard SAE size.

The amount of force, and thus the size of
impact pellets, required to de-fin a particular object
20 depends to some extent on the size and shape of the
object, the wall thickness, the type of metal and various
other factors involved in the casting process. For
example, it has been found that in the de-finishing of
engine blocks for automobiles, an impact pellet size of
25 one-fourth inch is optimal.

The machine of this invention is capable of
performing other functions additional to and other than
de-finishing. The machine can also be used in removing
sand and other excess materials or for smoothing rough
30 edges. It can be used for cleaning and for polishing.
It may also be desirable to provide a rotating wheel which
rotates at variable speeds and to adapt the feed means to
various sizes of impact pellets so that the machine can
most efficiently perform the various functions.

(4)

1 In the drawings:

Fig. 1 is a perspective view of the de-finning apparatus of this invention with portions thereof broken away for the purpose of clarity;

5 Fig. 2 is a perspective view of a cast engine block prior to the de-finning process, showing fins, rough edges, sand and other excess materials attached thereto;

Fig. 3 is a fragmentary bottom view of the cast
10 engine block prior to de-finning;

Fig. 4 is a perspective view similar to Fig. 2 but showing the cast engine block subsequent to the de-finning process;

Fig. 5 is a somewhat diagrammatic side sectional
15 view of a cast engine block and three machines constructed according to this invention for de-finning the block according to this invention;

Fig. 6 is a view showing a sample of the largest SAE standard size shot (SAE 1320); and

20 Fig. 7 illustrates the impact pellets of the present invention, showing impact pellets of the preferred size for de-finning cast engine blocks (.25 inch).

The de-finning apparatus 10 includes a main frame 12 in which an opening 14 is provided. The frame
25 12 is fixed relative to the object to be de-finned, and is aligned so that the opening 14 faces the object. A rotating member 16 is mounted on the frame 12 for rotation about an axis 18. A plurality of radially extending blades 20 are replaceably mounted on the rotating member 16.
30 The blades 20 have inner ends 22 that terminate at positions spaced a uniform and predetermined distance from the axis 18.

(5)

1 The machine 10 further includes a supply
conduit 24 which extends into the space between the
axis 18 and the inner ends 22 of the blades 20. An
opening 26 is provided in the terminal end 28 of the
5 conduit 24. The distance between the blade inner ends
22 and the conduit terminal end 28 is greater than the
largest diameter of the particles to be propelled by the
machine 10.

 A plurality of impact pellets 30 (Fig. 7)
10 are carried on the machine 10 in a supply hopper (not
shown) which supplies a feed spout 32. As can be seen
from a comparison of Figs. 6 and 7, the impact pellets
30 are of a size substantially greater than the largest
of the SAE standard sizes of shot 31 shown in Fig. 6.
15 The pellets shown in Fig. 7 are approximately one-fourth
inch in diameter, which has been found to be the pre-
ferred size for de-finishing cast engine blocks. Different
sizes of pellets 30 will be required for different
types of cast objects, and it is to be understood that
20 the invention is not limited to pellets 30 of the size
shown in Fig. 7 nor to pellets 30 of any particular size.
Each of the pellets shown in Fig. 7 has a diameter which is
1.33 times as large and a mass which is 2.37 times as large
as the largest SAE standard size shot. In comparison with
25 one-sixteenth inch shot, which is the largest size typically
used in conventional machines, the pellets 30 are 4 times
as large and 64 times as heavy.

 With reference again to Fig. 1, it is seen that
the feed spout 32 communicates with the supply conduit
30 24 so that impact pellets 30 are fed under the force
of gravity into the conduit 24. An inner passage 34 is
provided on the machine 10 and also communicates with the
supply conduit 24. A turbine or other forced air source

1 (not shown) is connected to the passage 34 and directs
a flow of forced air through the conduit 24 toward the
blades 20. The flow of air within the passage 34 and
conduit 24 is maintained at a sufficient pressure to force
5 the impact pellets 30 through the conduit 24 and onto the
inner ends 22 of the blades 20. The initial velocity of
the air flow must be sufficient to deliver the impact
pellets 30 onto the blades 20; the velocity required varies
with the weight of the pellets 30 and the length of the
10 gap between the conduit end 28 and the blade inner ends 22.

The invention is particularly well adapted for
operations involving cast objects such as engine blocks, as
seen in Figs. 2-5. However, the invention is capable of
being used with other types of objects such as crank shafts,
15 manifolds, and engine heads and is not limited to use
with engine blocks. After removal from a mold, a typical
cast object 36 contains various imperfections such as sand,
indicated at 38, clinging to the surface of the casting,
rough edges, indicated at 40, and fins, indicated at 42.
20 These various defects are removed as follows. As seen
in Fig. 5, the cast object 36 is supported within the
cabinet 44. The casting 36 can be rotatably or otherwise
movably mounted in the cabinet 44 so that all its surfaces
are exposed to the spray of impact pellets 30 or it can
25 be manipulated so that only certain surfaces are subjected
to the pellets 30. One or more of the machines 10 are
mounted on the cabinet 44 with the openings 14 thereof
facing the interior of cabinet and in particular facing
the object 36. The number of machines 10 chosen will
30 depend on various factors including the shape of the spray
pattern desired. Impact pellets 30 and forced air are
then fed into the conduit 24 of each machine 10. The
pellets 30 are delivered to the inner ends 22 of the blades

(7)

1 20. As the member 16 rotates, centrifugal force causes
the pellets 30 to move outwardly on the blades 20. When
a pellet 30 reaches the tip of the blade 20, it is pro-
pelled from the blade toward the cast object 36. The
5 accumulative effect of centrifugal propulsion of a plurality
of pellets 30 is a spray pattern which covers the surface
of the cast object 36.

The invention thus provides a new method and
apparatus for removing fins and other excess materials
10 from metal castings. The method of this invention involves
centrifugal propulsion of particles which impinge upon
the cast object with a force sufficient to remove fins. The
machine 10 is adapted to propel impact pellets 30 which
are of a size substantially greater than the particulate
15 shot used in conventional blasting machines. The invention
thus removes the need to manually chip away fins and
other excess materials, thereby saving substantial time
and expense.

Following de-finishing of the object 36 by the
20 apparatus 10, shot can be loaded into the feed spout 32,
and the same apparatus 10 can be used, if desired, to shot
blast the object 36. It should also be understood that
the apparatus 10 can be equipped with two supply hoppers
communicating with the spout 32, one containing shot and
25 the other impact pellets 30 for subjecting a casting to
the simultaneous action of the pellets and shot or first
the action of the pellets and then the shot. Alternatively,
other apparatus can be used for blast cleaning and objects
36 can be successively subjected to impact pellets 30
30 from the apparatus 10 for de-finishing purposes.

CLAIMS:

- 1 1. A machine (10) for removing fins (42)
and other excess metal from metal castings (36) compris-
ing a rotatably supported member (16) having a plurality
of radially extending blades (20) mounted thereon, said
5 blades having inner ends (22) which terminate at positions
spaced a uniform and predetermined distance from the
axis (18) of rotation of said member (16), a plurality
of impact pellets (30) contained on said machine each
of which has a nominal diameter greater than the largest
10 diameter SAE grade shot for peening and blasting and
further including a supply conduit (24) which extends
into the space between said axis of rotation and the inner
ends of said blades and terminates in a closely spaced
relation with said blades, said supply conduit being
15 operable to direct said impact pellets onto the inner ends
of said blades, said predetermined distance between the
terminal end of said supply conduit and the path defined
by the inner ends of said blades being greater than the
largest diameter of said pellets.
- 20 2. The machine according to claim 1 further
including means (34) for introducing into said supply
conduit air under sufficient pressure to force said impact
pellets through said conduit and onto the inner ends of
said blades.
- 25 3. A method for removing fins (42) and other
excess metal from metal castings (36) comprising the steps
of:
 - (a) aligning with the casting a rotatably
supported member (16) on which a plurality of radially
30 extending blades (20) are mounted;
 - (b) rotating said member (16) at a high rate
of speed; and

1 (c) feeding onto said blades a plurality
of impact pellets (30) each of which has a nominal
diameter greater than the largest diameter SAE grade
shot for peening and blasting so that the centrifugal
5 force of rotation of said member causes said impact
pellets to be propelled against said casting and into
engagement with said fins so as to knock the fins off the
casting.

4. The method according to claim 3 wherein
10 said blades have inner ends (26) which are spaced radially
from the axis of rotation of said member and said impact
pellets (30) are fed onto the inner ends of said blades.

5. The method according to claim 3 wherein
said impact pellets are fed onto said blades by forced
15 air directed toward said blades.

6. The method according to claim 5 wherein
said impact pellets and said forced air are directed
toward said blades through a supply conduit (24) which
terminates at a distance from said blades slightly greater
20 than the largest diameter of said impact pellets.

7. A method for de-finning a casting having
fins projecting therefrom which consists of propelling
against said casting a plurality of impact pellets so
that some of said pellets strike said fins, said impact
25 pellets being formed of metal and having sufficient mass
to remove said fins from said casting upon impact.

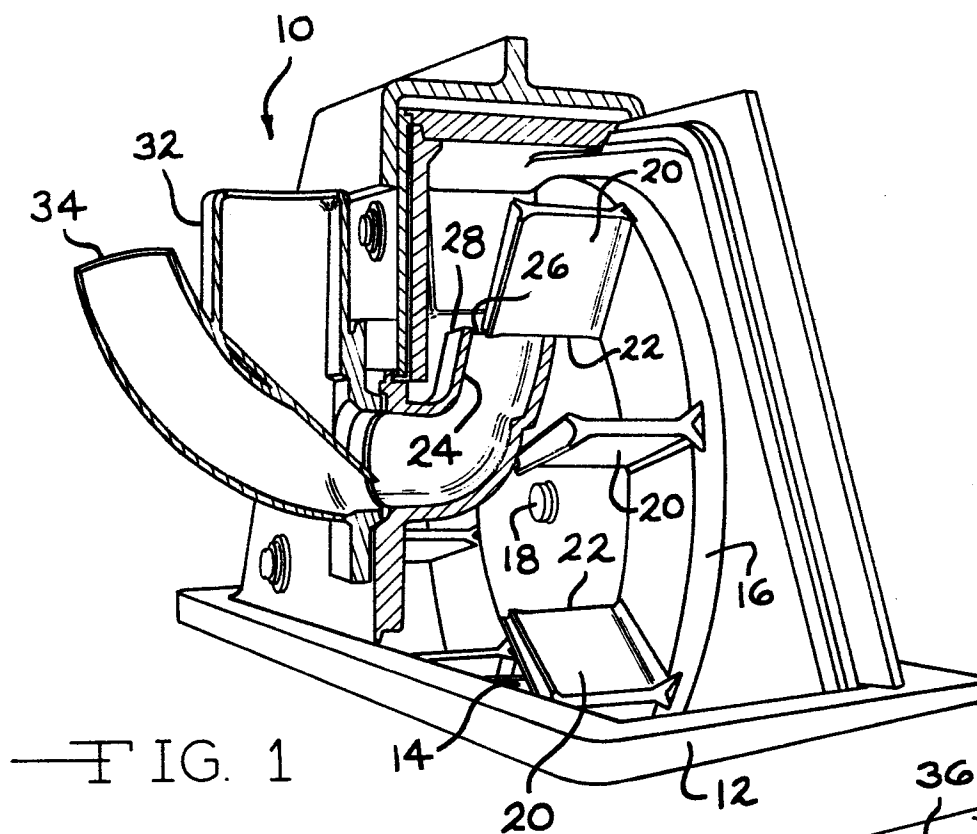


FIG. 1

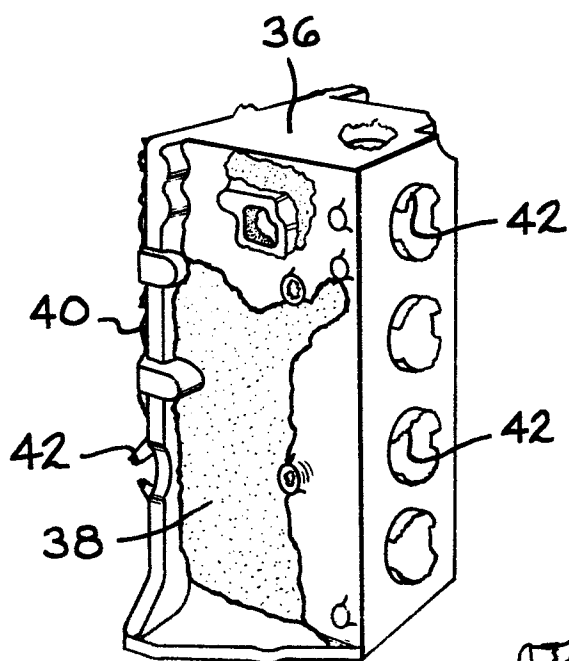


FIG. 2

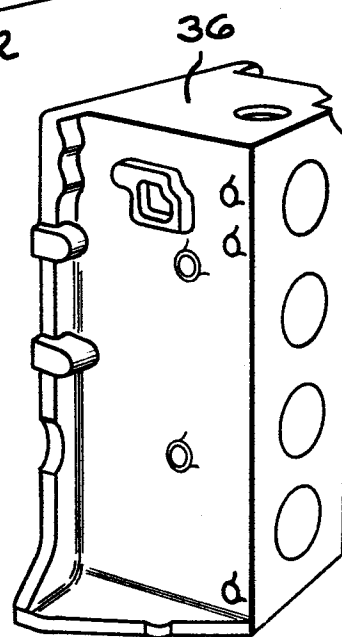


FIG. 4

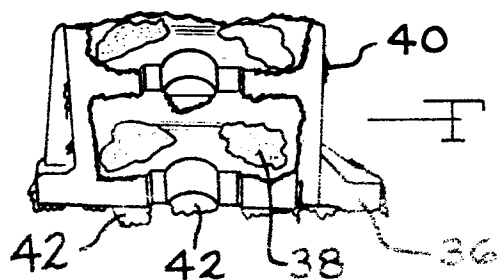
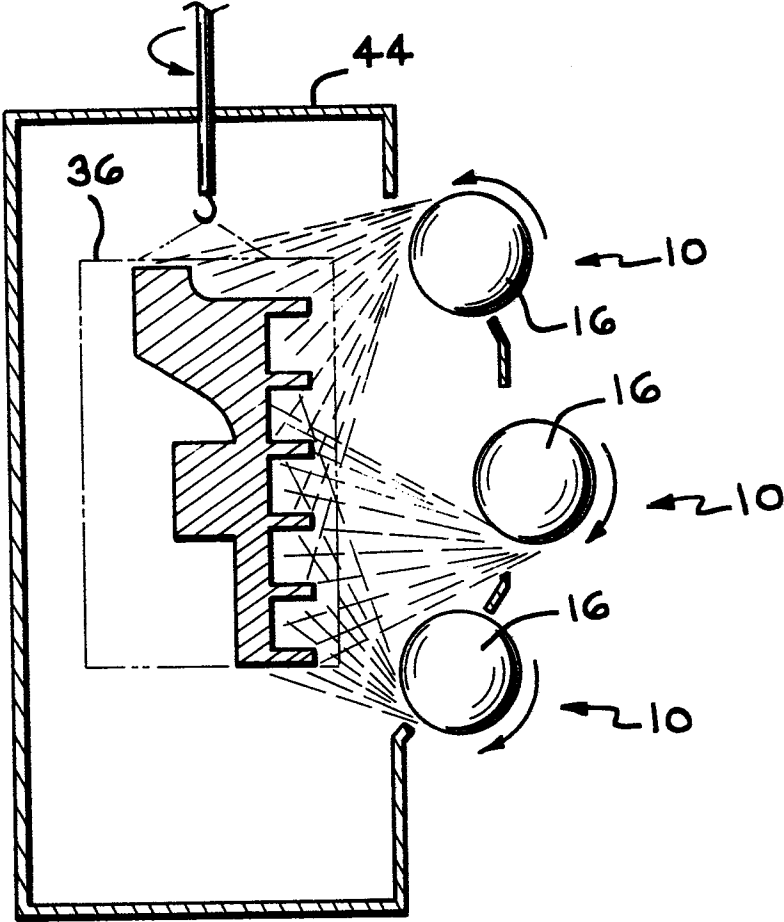
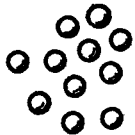


FIG. 3

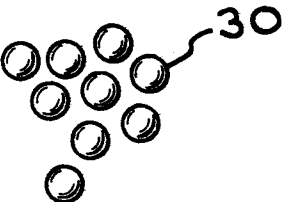


—FIG. 5

PRIOR ART



—FIG. 6



—FIG. 7



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EUROPEAN SEARCH REPORT

0095829

Application number

EP 83 30 1698

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	CH-A- 559 084 (G. FISCHER AG) * Column 1, lines 31-39 *	2,5	B 22 D 31/00 B 24 C 11/00 B 24 C 5/06
A	--- US-A-3 800 474 (SACK et al.) * Claim 1 * -----	3	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 22 D 31/00 B 24 C 11/00 B 24 C 5/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 18-08-1983	Examiner GOLDSCHMIDT G
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	