Claims

1. A tensioning frame for tensioning a printing screen, the tensioning frame comprising a plurality of elongate beams which extend around the periphery of the tensioning frame and define the tensioning frame, the tensioning frame being substantially planar, wherein at least one of the beams comprises an opening which is dimensioned to permit a printing screen to be received therethrough.

2. The tensioning frame of claim 1, wherein the opening is dimensioned to receive the printing screen therethrough in a direction parallel to the plane of the tensioning frame.

3. The tensioning frame of either of claims 1 and 2, wherein each beam comprises:

an engagement body at least partially located within the beam, the engagement body carrying an engagement surface for engaging with a printing screen in use, the engagement body being movable relative to the beam along a range of travel in a plane normal to the length of the beam, and

an actuator operatively connected to the engagement body for moving the engagement body, and hence engagement surface, relative to the beam;

optionally the actuator comprises one of the group consisting of pneumatic actuators, pneumatic pistons and electric actuators.

4. The tensioning frame of claim 3, wherein the plurality of beams define an interior region of the tensioning frame in which a central region of a printing screen is located in use, and the actuator is operative to move the engagement body in a direction towards the interior region;

optionally the tensioning frame comprises biasing means to impel the engagement body in a direction away from the interior region.

5. The tensioning frame of either of claims 3 and 4, wherein each engagement surface is formed on a respective engagement arm, which is movably mounted to a respective engagement body, the engagement arm being movable relative to the engagement body between a retracted position to permit a printing screen to be fully inserted into the

tensioning frame in use and an extended position in which the engagement surface may contact a printing screen in use;

optionally the engagement arm is pivotably or slidably mounted to the respective engagement body;

optionally the engagement arm is tensioned into the extended position, optionally by a spring.

6. The tensioning frame of any preceding claim, wherein each beam includes a profiled section to impel an edge of the printing screen towards said beam in use, optionally the profiled section comprises a spring.

7. The tensioning frame of any preceding claim, wherein each beam comprises a blade which is movable along a range of travel in a direction normal to the plane of the tensioning frame, between a withdrawn position in which the blade is spaced from the printing screen in use and an operational position in which the blade contacts the printing screen in use.

8. The tensioning frame of claim 7, wherein each beam comprises:

a respective actuating member which is movable along the length of the respective beam, and

a respective motion converting mechanism operative to convert the movement of the respective actuating member to movement normal to the plane of the tensioning frame, arranged such that the movement of each blade in use is driven by the respective actuating member via the respective motion converting mechanism;

optionally each respective actuating member is pneumatically or mechanically driven.

9. The tensioning frame of claim 8, wherein each respective motion converting mechanism comprises a slotted link mechanism or a Geneva mechanism.

10. The tensioning frame of any of claims 7 to 9, comprising a lock for locking the blade at the operational position, optionally the lock comprises a retractable locking pin.

11. A tensioning frame for tensioning a printing screen, the tensioning frame comprising a plurality of elongate beams which extend around the periphery of the tensioning frame and define the tensioning frame, the tensioning frame being substantially planar,

each beam comprising:

an engagement body at least partially located within the beam, the engagement body carrying an engagement arm for engaging with a printing screen in use, the engagement body being movable with respect to the beam along a range of travel in a plane normal to the length of the beam, and

an actuator operatively connected to the engagement body for moving the engagement body, and hence engagement arm, relative to the beam,

wherein the engagement arm is movably mounted to a respective engagement body.

12. The tensioning frame of claim 11, wherein each engagement arm is pivotably or slidably mounted to a respective engagement body.

13. The tensioning frame of either of claims 11 and 12, wherein the actuator comprises one of the group consisting of pneumatic actuators, pneumatic pistons and electric actuators.

14. The tensioning frame of any of claims 11 to 13, wherein the plurality of beams define an interior region of the tensioning frame in which a central region of a printing screen is located in use, and the actuator is operative to move the engagement body in a direction towards the interior region;

optionally the tensioning frame comprises biasing means to impel the engagement body in a direction away from the interior region, optionally the biasing means comprises a spring.

15. A method of loading a printing screen into a tensioning frame, comprising the steps of:

i) providing a tensioning frame, and

ii) inserting a printing screen into the tensioning frame through a side thereof.

16. The method of claim 15, wherein the tensioning frame is substantially planar and comprises an opening in a side thereof, dimensioned to receive the printing screen in a direction parallel to the plane of the tensioning frame.

17. The method of claim 16, wherein the tensioning frame comprises:

a plurality of elongate beams which extend around the periphery of the tensioning frame and define the tensioning frame, the tensioning frame being substantially planar,

an engagement body at least partially located within a beam, the engagement body carrying an engagement arm for engaging with a printing screen in use, the engagement body being movable relative to said beam along a range of travel in a plane normal to the length of said beam, and

wherein the engagement arm is movably mounted to a respective engagement body, and wherein step i) comprises moving the engagement arm relative to the engagement body into a retracted position in which, in step ii), the printing screen may be fully inserted into the tensioning frame without contacting the engagement arm;

optionally the method comprises the step, performed subsequent to step ii), of:

iii) moving the engagement arm relative to the engagement body into an extended position and moving the engagement body relative to said beam to bring the engagement arm into contact with the printing screen and apply tension thereto;

optionally said beam comprises a blade which is movable along a range of travel in a direction normal to the plane of the tensioning frame, between a withdrawn position in which the blade is spaced from the printing screen in use and an operational position in which the blade contacts the printing screen in use, the blade located in the withdrawn position during step ii), the method further comprising the step, performed subsequent to step ii), of:

iv) moving the blade from the withdrawn position to the operational position to bring the blade into contact with the printing screen.

18. The method of either of claims 16 and 17, wherein step ii) comprises using a robot, optionally an autonomous intelligent vehicle, to insert the printing screen into the tensioning frame.

19. The method of any of claims 16 to 18, comprising an initial step of locating the tensioning frame within a printing machine, optionally using a robot, optionally the robot comprises an autonomous intelligent vehicle.

20. A robot, optionally an autonomous intelligent vehicle, for loading a printing screen into a tensioning frame, comprising:

a printing screen storage magazine for storing at least one printing screen, and

a transfer mechanism for transferring a printing screen from the printing screen storage magazine laterally into a tensioning frame.

21. The robot of claim 20, further comprising a frame storage, for storing a tensioning frame, and the transfer mechanism is adapted to transfer the tensioning frame into a printing machine.